YOUR

# COMMODORE

SEPTEMBER 1988

£1.20

**PARTNER–The ultimate companion for your C128**

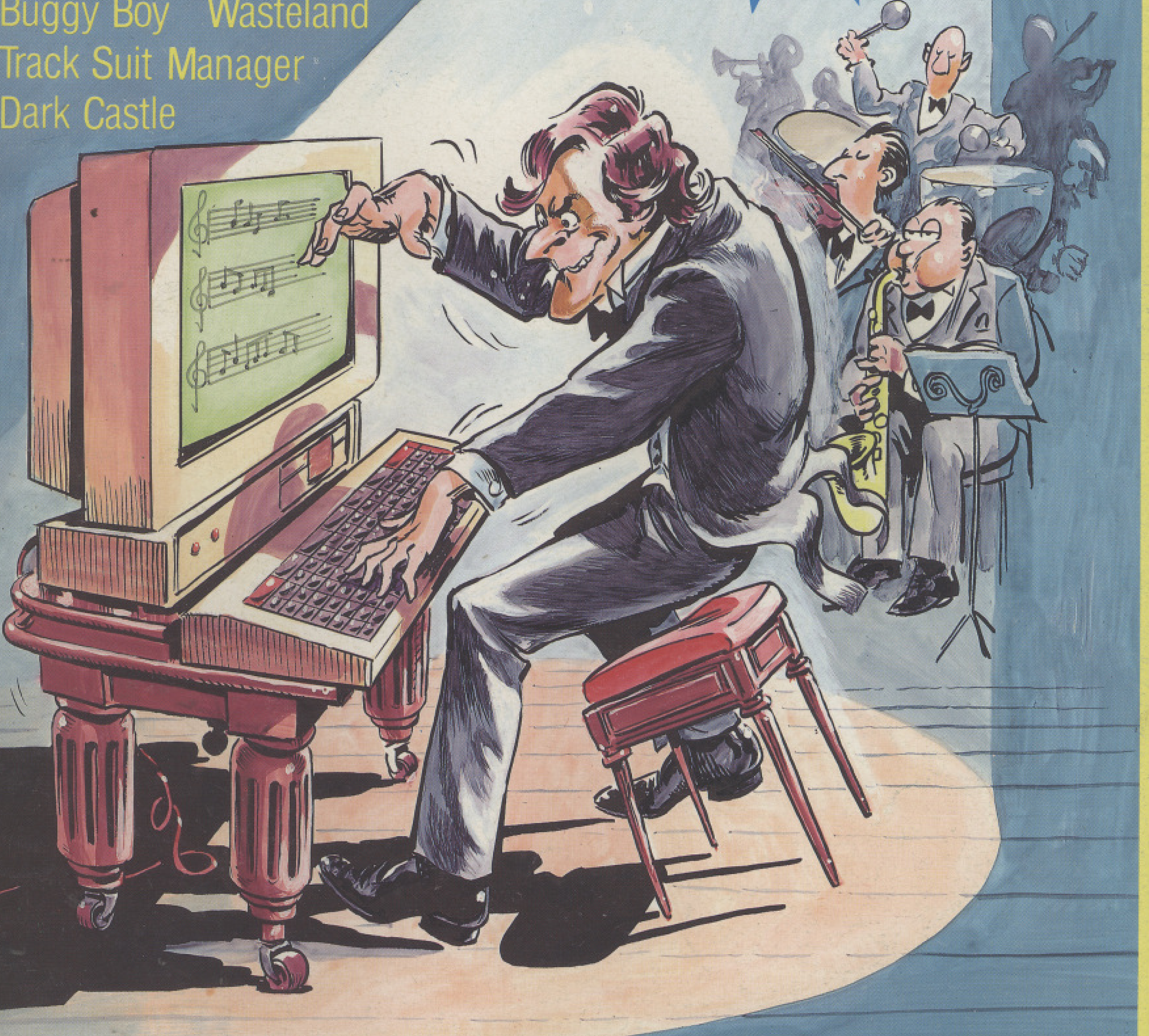
**Games Reviewed:**

Buggy Boy  Wasteland

Track Suit Manager

Dark Castle

DTP on a C64!



## COMPUTER MUSIC – The Way Ahead?

**UNBEATABLE PROGRAMS:**

MUSIC COMPOSER □ SAMPLER 64 □ FX-EDITOR □ C16 DISK MONITOR

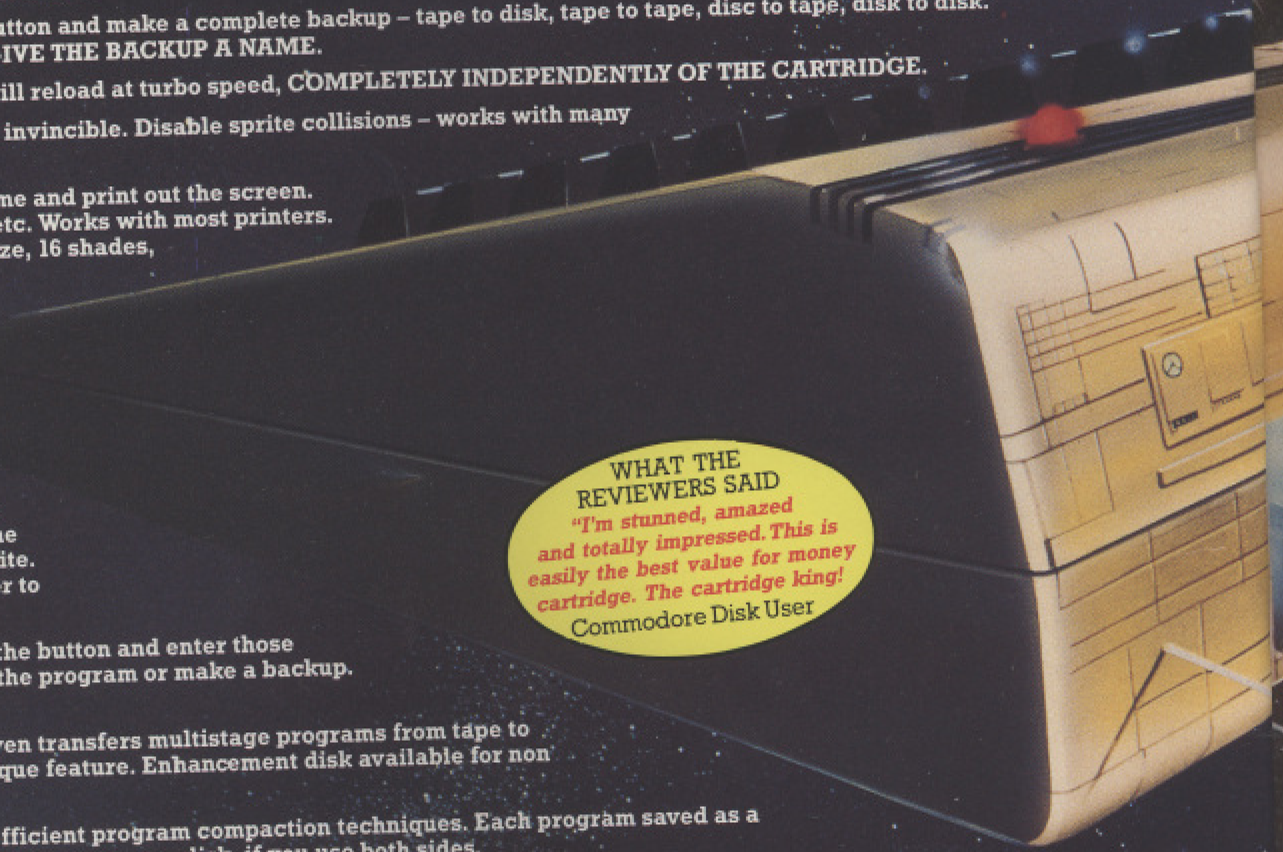
# TOTAL BACKUP POWER
# Now ACTION REPLAY

## NOW EVEN MORE POWERFUL, MORE FRIENDLY AND WILL

ONLY **£29·99** POST FREE

**Action Replay works by taking a *'SNAPSHOT'* of the program in memory so it doesn't matter how the program was loaded – from tape or disk – at normal or turbo speed.**

- **WARP 25. THE WORLD'S FASTEST SERIAL DISK TURBO – NOW EVEN FASTER! LOADS 200 BLOCKS IN 6 SECONDS! 240 BLOCKS IN 7 SECONDS!** – that's even faster than some parallel systems. Built into the cartridge – no extra hardware or software required. Includes supercast, warpsave, scratch, filecopy/convert. Integrated with normal disk turbo for supercompatibility – auto detects warp or normal format so no special load commands are required. Turbo and Warp 25 speed are entirely independent of the cartridge with SUPERBOOT.
- **SIMPLE TO USE:** Just press the button and make a complete backup – tape to disk, tape to tape, disc to tape, disk to disk. THE PROCESS IS AUTOMATIC – JUST GIVE THE BACKUP A NAME.
- **TURBO RELOAD.** All backups will reload at turbo speed, COMPLETELY INDEPENDENTLY OF THE CARTRIDGE.
- **SPRITE KILLER.** Make yourself invincible. Disable sprite collisions – works with many programs.
- **PRINTER DUMP.** Freeze any game and print out the screen. Eg. loading picture, high score screen etc. Works with most printers. MPS 801, 803, Star, Epson etc. Double size, 16 shades, reverse print option. Very versatile – no user knowledge required.
- **PICTURE SAVE.** Save any Hires multicolour screen to disk at the push of a button. Compatible with Blazing Paddles, Koala, Artist 64, Image System etc.
- **SPRITE MONITOR.** Unique Sprite monitors allows you to freeze the action and view all the sprites, watch the sprite animation, save or delete any sprite. Load sprites from one game into another to make customised programs.
- **POKES/CHEAT MODE.** Press the button and enter those pokes for extra lives etc., then restart the program or make a backup. Ideal for custom games.
- **MULTISTAGE TRANSFER.** Even transfers multistage programs from tape to disk. The extra parts fast load – a unique feature. Enhancement disk available for non standard multi-loaders (see below).
- **SUPER COMPACTOR.** Ultra efficient program compaction techniques. Each program saved as a single file. 3 programs per disk side – 6 programs per disk, if you use both sides.
- **TEXT MODIFY.** Change title screens, high score screens etc. Put your own name into a game then restart it or make a backup to tape or disk. Very simple to use.
- **MONITOR.** Full feature 'Floating' type MACHINE CODE MONITOR. All standard features plus many more:- assemble, disassemble, hex dump, interpret, transfer, compare, fill, hunt, number conversion, bank switching, relocate, load/save etc. Uses no memory. Full printer support.
- **DISK MONITOR.** A special monitor for use on the RAM inside your disk drive. All the usual commands – a useful hacking tool.
- **WHOLE DISK COPY.** Copy a full unprotected disk in under two minutes with only one drive.
- **FAST FILE COPY.** Works with standard and Warp 25 files of up to 249 blocks. Converts formats to and from Warp 25.
- **FAST FORMAT.** Under 20 seconds.
- **TOOLKIT COMMANDS.** A whole range of useful new commands including: AUTO LINE NUMBERING, DELETE, MERGE, APPEND, OLD, LINESAVE, etc., PRINTERLISTER – list any program (including directory) directly from disk to printer or screen without corrupting memory.
- **REDEFINED FUNCTION KEYS.** Single stroke commands for operation of many common commands including: LOAD, SAVE, DIR. Load from directory – no need to type in filename.
- **TAPE TURBO.** Designed to make turbo load/save for your own programs. No screen blanking during loading.



WHAT THE REVIEWERS SAID
*"I'm stunned, amazed and totally impressed. This is easily the best value for money cartridge. The cartridge king!"*
Commodore Disk User

***REMEMBER*** all features are built in and available at the touch of a key. All features work with both **TAPE** and **DISK.** (Except multipart transfer & disk file utility).

### ACTION REPLAY ENHANCEMENT DISK

The biggest and best collection of special parameters and file copy programs for transferring non-standard multi-load tapes to disk – games like **LAST NINJA, CALIFORNIA GAMES, LEADERBOARD, DRAGON'S LAIR** – SEVENTY titles in all. Almost all major titles covered. Latest edition includes **COMBAT SCHOOL, PLATOON, PREDATOR, GAUNTLET II, TESTDRIVE, SKATE OR DIE, APOLLO 18, THE TRAIN** and many more. Cheats for infinite time, lives etc. The **GRAPHIC SLIDESHOW** – latest edition displays multicolour pictures or loading screens saved by Action Replay or any major Art Package – Blazing Paddles, Koala, Advanced Art Studio, Artist 64 etc. Lots of fun.
Only **£7.99**. Upgrades – send £3.00 plus old disk.

# RTAKES A QUANTUM LEAP
# YMK IV HAS ARRIVED!

FOR CBM64/128

## LLBACKUP MORE PROGRAMS THAN ANY RIVAL UTILITY.

**BUT THATS NOT ALL ... NOW AVAILABLE FOR THE SERIOUS PROGRAM HACKER**
**ACTION REPLAY IV 'PROFESSIONAL'™**

- All the features of the normal Action Replay IV but with an amazing on board LSI LOGIC PROCESSING CHIP. Plus 32K operating system ROM and 8K RAM CHIP. The first RAM/ROM based cartridge of its type!

to
oo



*ALL THE MK IV FEATURES PLUS ...*

- **FULLY INTEGRATED OPERATION.**
The MK IV 'Professional' has all the features of the MK IV plus an onboard custom LSI LOGIC PROCESSING CHIP that integrates the whole range of utilities and makes them available at the press of a button at any time.
- **EXTENDED MONITOR.**
The 'Professional' has an extra powerful machine code monitor. Because it has both ROM and Ram at its disposal the Professional can freeze any program and then examine the WHOLE OF COMPUTER MEMORY in the frozen state including screen RAM, ZERO PAGE and STACK.
Full feature disassembly, compare, fill, transfer, hunt, relocate, jump etc, etc. In fact all the features of the best fully blown monitor available. Return to the frozen program at the press of a key at the point you left it! An absolute must for the program hacker – or even the programmer who needs to de-bug his program.
- **INTELLIGENT HARDWARE**
The Professional hardware is unmatched anywhere in the world today. The special logic processing chip can cope with protection methods as they appear by reacting to its environment.
- **RAM LOADER**
In addition to Warp 25, the AR4 Professional now has RAM LOADER. Making use of its onboard 8K Ram the Professional can also load commercial disks directly at up to 25 times normal speed. Remember this feature is in addition to AR4's unique Warp 25 feature that reloads all backups at 25 times speed.

**MK IV PROFESSIONAL ONLY £34·99 POST FREE**

**WARP 25** Reloads an average BACK-UP in 6 Seconds!!

### UPGRADE INFORMATION

**MK III TO MK IV.** Just send £9.99 and we will send you the new MK IV Chip to plug into your cartridge. Fitting is very easy.
**MK III TO MK IV 'PROFESSIONAL'.** Send your old cartridge plus £19.99 and we will send you a new Professional MK IV.
MK 2 Action Replay owners can get £10 as part exchange against either the MK IV or Professional. Send old cartridge plus balance.

### PERFORMANCE PROMISE

Action Replay will backup any program that any other cartridge can backup – and more! It also has an unmatched range of onboard features. Before you buy check our competitors ads to see what they offer and see how many of the Action Replay MK IV features are either not there or have to be loaded from Supergate disks etc. When you buy Action Replay if you don't find our claims to be true then return it within 14 days for a full refund.

ALL ORDERS NORMALLY DESPATCHED WITHIN 48 HRS

## HOW TO ORDER ...

| BY PHONE | BY POST | UK ORDERS POST FREE |
|---|---|---|
| 0782 744707<br>24 hr Credit Card Line | Send cheques/PO's made payable to 'Datel Electronics' | EUROPE ADD £1.00 / OVERSEAS ADD $3<br>FAX 0782 744292 |

# DATEL ELECTRONICS

DATEL ELECTRONICS LTD, FENTON INDUSTRIAL ESTATE, GOVAN ROAD, FENTON, STOKE-ON-TRENT, ENGLAND

| SALES ONLY | TECHNICAL ONLY |
|---|---|
| 0782 744707 | 0782 744324 |



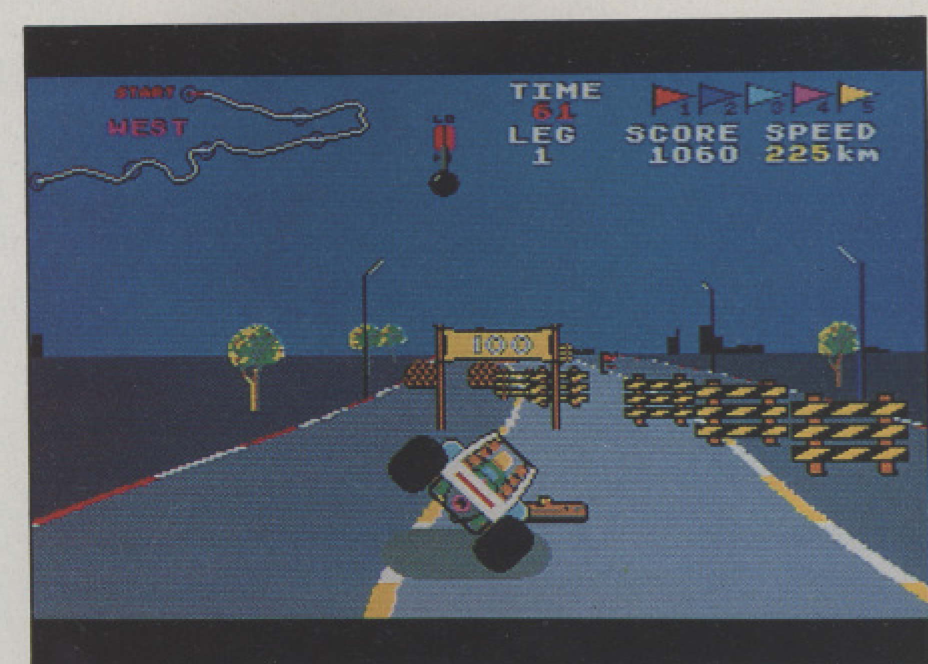

Editor: Stuart Cooke
Deputy Editor: Sue Joyce
Technical Editor: Fred Reid
Advertisement Manager: Paul Kavanagh
Advertisement Copy Control: Andrew Selwood
Origination: Ebony Typesetting
Artist: Alan Batchelor
Designer: Neil Sweetman

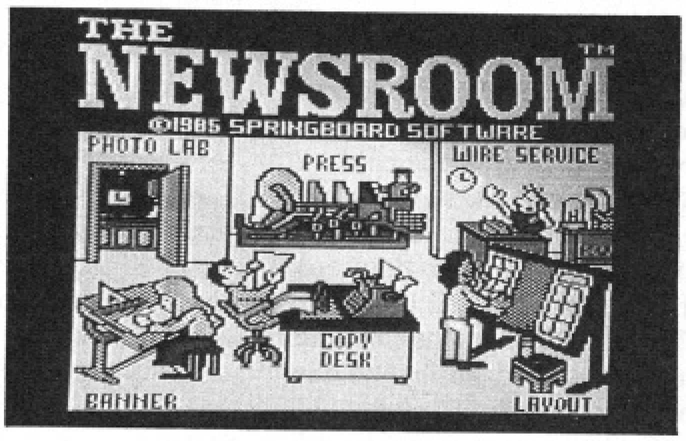
Your Commodore incorporating Your 64 is a monthly magazine appearing on the first Friday of each month. Argus Specialist Publications Limited Editorial & Advertisement Office, Your Commodore, No 1 Golden Square, London W1R 3AB. Telephone: 01-437 0626 Telex: 8811896.
Subscription rates upon application to Your Commodore Subscriptions Department, Infonet Ltd, 5 River Park Estate, Berkhamsted, Herts, HP4 1HL. U.S.A. Subscription Agent: Wise Owl Worldwide Publications, 4314 West 238th Street, Torrance CA 90505 U.S.A.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

## REGULARS









**VOLUME 4**
**NUMBER 12**

ARGUS PRESS GROUP

**OCT ISSUE AVAILABLE 2nd SEPTEMBER 1988**


The contents of this publication including all articles, designs, drawings and programs and all copyright and other intellectual property rights therein belong to Argus Specialist Publications Limited. All rights conferred by the Law of Copyright and other intellectual property rights and by virtue of international copyright conventions are specifically reserved to Argus Specialist Publications Limited and any reproduction requires the prior written consent of the Company. © 1988 . Distribution SM Distribution, 6 Leigham Court Road, London SW16 2PG. Printed by Chase Web, Plymouth. Opinions expressed in reviews are the opinions of the reviewers and not necessarily those of the magazine. While every effort is made to thoroughly check programs published for errors we cannot be held responsible for any errors that do occur.

ISSN 0269-8277

## FAST Action

AT CLACTON Magistrates Court, The Federation Against Software Theft scored one of its greatest victories in its fight against piracy. Jeffrey Batty, the proprietor of the Clacton-based Orion Software, was fined £4,500 for operating a mail order software lending library which principally relied on a stock of 3000 pirated titles.

Last year, on the 28th October, FAST's enforcement co-ordinator, Bob Hay, was assisted by Peter Korwen of Essex Trading Standards joined a police raid on Batty's home which resulted in the confiscation of the pirated stock. Although Batty had only been operating for nine months, the profit from Orion's nationwide mail order business was estimated at over £6,000.

Despite a warning six months before his arrest, Batty continued to operate his professionally organised library and, in sentencing Batty to pay a fine of £4,400 with £100 costs, the chairman of the bench commended Batty on his enterprise but emphasised that such an illegal business could not be condoned.

The case highlights the dilemma facing the software industry in the light of current legislation being passed through parliament. A proposed ammendment to the Copyright, Design and Patents Bill has had a clause re-introduced which will mean that a levy is charged on all blank audio tapes which would effectively legalise home taping of audio material. Although the new levy would recoup handsome returns for the record and musicassette industry, the software industry will be left out in the cold.

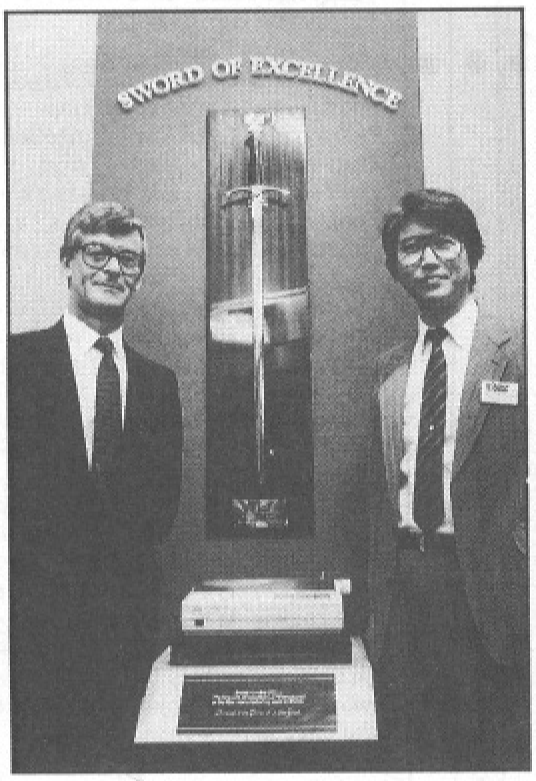
From the tape user's viewpoint, the fact that a levy had been paid could lead to the misconception that any form of home taping would be within the law. The effect would then be that greater revenue would be lost to the already blighted software houses.

Roger Tuckett, chairman of FAST sees the new Bill as being a serious threat to the work of the Federation, "We have been very pleased with the progress of the Bill so far which has gone a long way to protect the copyright interests of the UK software industry. Although a levy would, in some way, compensate the music industry for loss of copyright through home taping, it would undermine FAST's efforts to protect intellectual property and to prevent illegal copying in all forms. It would undoubtedly lead to increased software piracy and consequently represent a significant loss of income for the UK computer software industry.

We therefore support the Government in opposing the re-introduction of a blank tape levy."

The tape levy proposal has survived the second reading of the Bill and FAST will be using the recent case in Clacton to support their argument that the levy should be all-embracing or dropped from the Bill altogether.

## Star Gains Prince's Trust




*Dr William Smith receives the first Welsh LC-10 from T.Takahashi, Star's Managing Director*

STAR MICRONIC'S first British-made LC-10 printer was presented to Dr William Smith, Executive of Prince's Trust Events, at the recent PC User Show. The Trust, whose patron is the Prince of Wales, will use the LC-10 to help its efforts in raising money for charity. The printer was deemed a particularly suitable gift because Star's new production line is based at the Tafernaubach Industrial Estate in Tradegar.

The new production line is dedicated to the production of LC-10's for Star's British, French and German subsidiaries but future development will increase the monthly output from 10,000 to 30,000 by the end of the year. This will mean expanding the present workforce in an area of the country which badly needs the extra jobs.

The LC-10 has been introduced as a replacement for the NL-10 printer and offers a multifont printing capability for £229.

***Touchline:** Star Micronics, Craven House, 40 Uxbridge Road, Ealing, London W5 2BS. **Tel:** 01-579 2259.*

## Destiny's Star Tracks

DESTINY SOFTWARE'S next game, Diamond, includes a free single by a 'newly emerging' band, The Company She Keeps. The cassette features two tracks by the band, entitled What She Wants and Express Interest.

Destiny's managing director, Francis Lee, sees a healthy future in promoting music and software together in this way. "Promoting music through software seems an ideal way of letting people access music they perhaps otherwise would never hear", comments Lee.

We agree - what better way to promote new bands and give the punters something for nothing at the same time! Could this become a new trend? Write your comments on a five pound note...

***Touchline:** Destiny Software, Lamerton House, 23 High Street, Ealing, London W5 5DF. **Tel:** 01-567 6677.*

## PC Showtime

THE SCENE IS SET for the annual industry scrumdown at the Personal Computer Show, formerly the PCW Show. Each year brings new products, new record attendances and new controversies. One thing is guaranteed, there's never a dull moment.

The Show is rather like a carnival parade, with each company trying to outdo the others by covering more and more space with imaginatively designed, decorative stands. In the past we've witnessed strippers, near punch-ups, programmer defections, showtime romances and enough intrigue to keep a soap opera going for years.

Behind the glitzy appeal of the home computing hall, there's the more serious Business Hall which last year attracted 48,000 of the Show's 80,000 visitors. The Show attracts exhibitors from all over the world and last year it was given media coverage in 22 countries.

Don't let the new name put you off, the PC Show does have a bias towards IBM compatibles but this is mainly confined to the business section. In the Main Hall you will still find US Gold, Gremlin, Telecomsoft, Mastertronic and all the other big names in the games field. In addition, Commodore will be taking their stand with the emphasis being laid on the promised big announcements for the Amiga and the Commodore 64.

The venue has been changed this year from Olympia to the larger facilities at Earl's Court. The dates for your diary are 14-18th September for trade and 16-18th visitors.

***Touchline:*** *The Ticket Office, The Personal Computer Show, 11 Manchester Square, London W1M 5AB.* ***Tel:*** *(0203) 470075.*

## No Simulation

The recent Le Mans victory for the British Jaguar XJR 9LM team provided Code Masters with yet another reason to celebrate – the winning team included the Code Masters' sponsored racing driver Johnny Dumfries. With co-drivers Jan Lammer and Andy Wallace, the team not only knocked Porsche off the top slot but also gained Jaguar its first Le Mans 24 Hour Race win in 30 years.

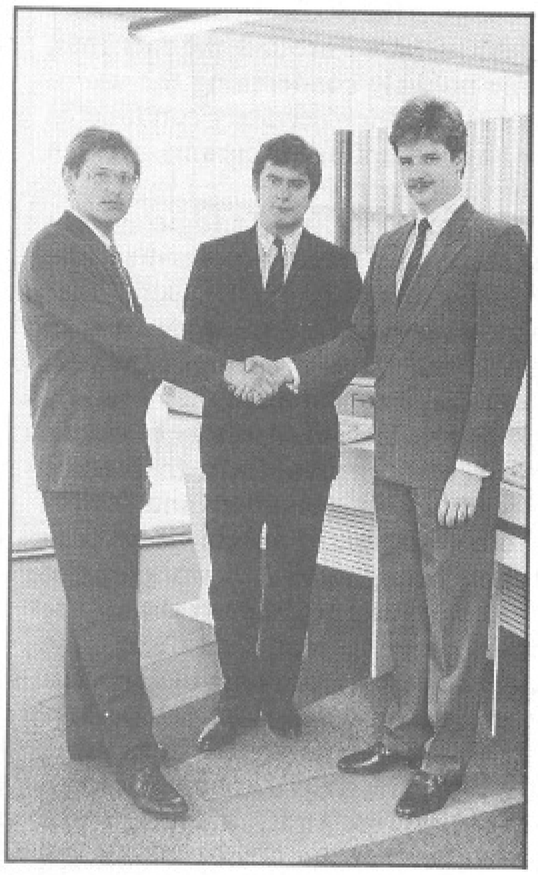
The success adds extra charisma to Code Master's current project, Johnny Dumfries' World Championship, which is scheduled for release this autumn.

***Touchline:*** *Code Masters Software, Lower Farm House, Stoneythorpe, Southam, Warks. CV33 ODL.* ***Tel:*** *(0926) 814 132.*




*'Jaguar' Dumfries – Code Masters' championship driver*

## RPS Get CBM OK



COMMODORE UK have followed the example of the West German Division by licensing RPS to produce the Commodore branded 5.25 and 3.5 inch diskettes.

Dean Barrett, UK marketing manager for Commodore, explains, "The evidence from our involvement in West Germany is impressive and we are convinced that this agreement will guarantee the highest quality product for our users and, importantly, provide total support for our dealers."

The disks will be manufactured at the RPS factory in Albi, France and distributed over here by SJB Disks. On this subject, Ivor Norkett, business manager at RPS, stated, "We have selected SJB Disks to distribute Commodore diskettes on an exclusive basis because it is a highly successful operation dedicated solely to the supply and marketing of computer media and can provide a total support package to Commodore dealers."

***Touchline:*** *RPS, High Street, Houghton Regis, Bedfordshire LU5 5QL.* ***Tel:*** *(0582) 867222.*

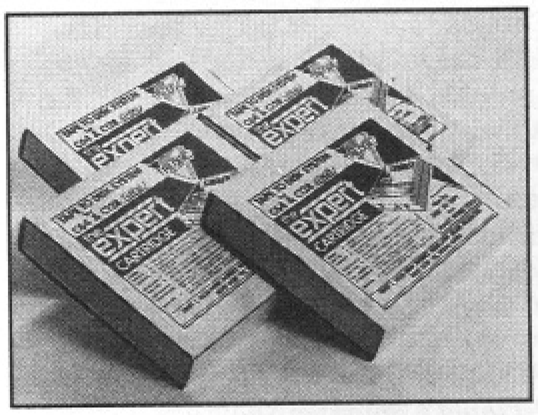
## Expert Pirates?

TRILOGIC ARE currently running an anti anti-piracy league attack in defence of the Expert cartridge. The assault is based around the fact that, while publicly condemning the use of the Expert, they privately condone its use by accepting programs written with the Expert's aid.

Graham Kelly, Trilogic's joint managing director, describes the cartridge as a programmer's aid rather than a weapon in the piracy war. In the absence of training schemes, programmers must learn their craft by fair means or foul. Authors of books or magazine articles learn their trade by studying the techniques and devices of other authors. This means reading and dissecting published works in the same way as the Expert allows the programmer to read and dissect the code routines which constitute the best of British software.

While condemning the illegal uses of the Expert, Kelly's argument hinges on the claim that, although the cartridge can be used for illegal copying, the piracy factor is beside the point. Copying of cassette originated material is achieved as easily with a dual cassette deck as it is with the Expert. If the cartridge was withdrawn from the market, the piracy subculture would not be affected in the slightest.

Some companies such as Durell and Future Concepts even acknowledge Trilogic's product on the cassette inlay cards, while at least one member of the anti-piracy lobby used the threat of withdrawing its large advertising revenue to force a Commodore magazine to refuse advertising from Trilogic for several months.



*The Expert, pirates cudgel or programmer's aid?*

One programmer who freely admits that he uses the Expert is John Twiddy, the author of Ikari Warriors and The Last Ninja. "The Expert cartridge enables me to program much faster," he says, "Without Expert, Last Ninja would have taken me a lot longer to program and would not have appeared on the shelves until many months later."

Kelly encapsulates the Trilogic argument by stating, "It is with reason that our main product is called 'Expert'. Any person who uses their Commodore for serious purposes would probably acknowledge that, in their expert opinion, Expert is an essential tool."

The controversy will, no doubt, rage on but surely the argument has no suitable solution. Just as a hammer is a tool of construction as well as of destruction, so the Expert and its kin have their light and dark sides.

***Touchline:*** *Trilogic, Unit 1, 253 New Works Road, Bradford BD12 0QP.* ***Tel:*** *(0274) 691115.*

## Peace In Our Time

TELECOMSOFT AND HEWSON have at last decided to bury the hatchet over the Morpheus and Magnetron controversy. Their differences were 'amicably reconciled' ending the threat of interminable court hearings.

The situation blew up on the eve of last year's PCW Show when Graftgold decided to desert Hewson in favour of Telecomsoft. This left Andrew Hewson with a rather sorry looking stand organised around the theme of the two forthcoming releases on the Rainbird label.

Since neither company cares to comment on the situation it's not known if they've just decided to kiss and make up or whether they made a verbal agreement in used pound notes.

***Touchline:*** *Hewson, What argument?, Severed, Lincs. Telecomsoft, Andrew who?, Contentment, near Bliss.*

## Green Listings

ENVIRONMENTALISTS MAY be interested to hear that Zweckform now produces a pastel green printout paper produced from recycled paper. This provides a warmer alternative to the more usual off-white paper which Zweckform have been marketing in the past.

Zweckform produces its recycled paper to help conserve the Earth's natural resources by saving trees, energy and water. The finished paper is equivalent in quality to comparable grades of wood-free paper but is slightly less expensive.

1000 sheets of either colour paper is priced at £10.87 and the off-white is also available in quantities of 500 for £5.98.

***Touchline:*** *Zweckform UK, Merchant Drive Industrial Estate, Mead Lane, Hertford Herts. SG13 7AY.* ***Tel:*** *(0992) 551777.*

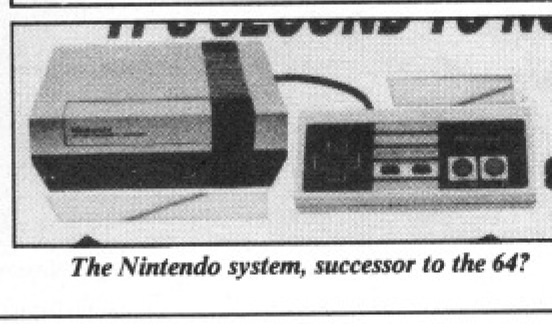
## Amiga Companion?

THE NINTENDO games console may become the natural companion to the Commodore Amiga, according to Luther De Gale of De Gale Marketing. At under £100, the machine offers a relatively inexpensive way to keep the kids amused while their parents get down to the more serious applications of the Amiga.

Another factor to support De Gale's claim is the Nintendo licensing system which tightly controls the quality and range of Nintendo products. In theory, this means that many of the games designed or converted for the machine will not be available for the Amiga. With sales of the Spectrum dipping lower, De Gale sees the Nintendo as a natural successor to Amstrad's adopted machine and also sees it as a serious threat to the Commodore 64.

Luther De Gale left Konami UK earlier this year to head his own company with backing from coin-op moguls, Electrocoin, and he is now busy using his detailed knowledge of the Japanese computer sector to establish himself as this country's major supplier of the Nintendo system.

***Touchline:*** *De Gale Marketing, 81 Tottenham Court Road, London W1A 1EY.* ***Tel:*** *01-637 5735.*



*The Nintendo system, successor to the 64?*

# DIMENSION computers l.t.d.

27/29 High Street
Leicester LE1 4FP
Tel: (0533)
517479/21874

## THE MIDLAND'S LARGEST COMPUTER STORE

**CANON PJ1080A COLOUR INK JET**
* Virtually silent operation
* Seven colour text and high resolution colour graphics printing (640 dots per line)
* Uses plain, single sheet or roll paper
* Supplied with AMIGA printer driver software ........ £499.95

**AMIGA BUSINESS PACK**
* Amiga A500 computer
* 1084 high resolution colour monitor
* Citizen 120D printer
* Monitor and printer cables
* The works-integrated spreadsheet, wordprocessor and database
* Transformer-PC Emulator ........ £779.00

| | |
|---|---|
| 302C 1Mb A500 3.5" External Drive | £99.95 |
| Cumana 1Mb 3.5" External Drive | £109.95 |
| Internal A2000 2nd Drive | £79.95 |
| Amiga Midi Interface | £49.95 |
| Digiview Colour Digitiser | £139.95 |
| Supra 20Mb A500 Hard Disc including Diskmaster Software | £649.00 |
| 2Mb Internal RAM Expansion | £449.00 |
| A500 512K RAM Upgrade | £109.95 |
| Future Sound Digitiser, including microphone | £169.95 |
| Perfect Sound Digitiser, with stereo recording facility | £74.95 |
| Audiomaster Sampling Software | £39.95 |
| Sonix Synthesis Software | £49.95 |
| Prowrite V2 Wordprocessor | £79.95 |

## AMIGA RANGE

**AMIGA A2000 PACK OFFER**
Amiga A2000 1Mb with Mouse, Workbench, Workbench Extras, GW Basic and 20Mb A2090/2092 Hard Disc
With 1081/1084 Monitor ........ £1379.00 + VAT
Without Monitor ........ £1169.00 + VAT

**AMIGA A500 PACK 1**
with Mouse, Workbench, Basic, DPAINT, TV Modulator, 40 Disc Storage Box, Dust Cover and 10 Games/Utility Discs ........ £415.00

**AMIGA A500 PACK 2**
with Mouse, Workbench, Basic and DPAINT Software ........ £379.00

**COMMODORE 1084 COLOUR MONITOR**
High RES, Non Reflective Screen ........ £229.00

**AMIGA A500 with PHILIPS 8833 HIGH RES COLOUR MONITOR** with STEREO SOUND OUTPUT, Mouse, Workbench, Basic, plus DPAINT Software ........ £629.00

**AMIGA A500 with COMMODORE 1084 HIGH RES COLOUR MONITOR** Mouse, Workbench, Basic, plus DPAINT Software ........ £599.00

**STAR LC10 COLOUR DOT MATRIX**
* 120 cps Draft, 30 cps NLQ
* 6 Resident Fonts and 6 Print Pitches
* Draft and NLQ in all Fonts and Colours
* 7 Colours plus Multiple Shade Graphics

Includes AMIGA Printer Lead ........ £229.95

**THE WORKS**
Spreadsheet, Wordprocessor and Database ........ £69.95

**PHILIPS 8833 COLOUR MONITOR** ........ £259.00

## LIMITED AMIGA SOFTWARE OFFERS

**GRAPHICS PACK**

| | |
|---|---|
| Express Paint | £59.95 |
| Pageflipper Animator | £34.95 |
| IntroCad CAD System | £59.95 |
| Normally £154.85 OFFER PRICE | £99.95 |

**DESKTOP PUBLISHING PACKAGE**

| | |
|---|---|
| Vizawrite Wordprocessor | £99.95 |
| Citydesk Desktop Publisher | £99.95 |
| Normally £199.90 OFFER PRICE | £149.95 |

**BUSINESS PACK**

| | |
|---|---|
| Vizawrite Wordprocessor | £99.95 |
| Logistix Spreadsheet | £99.95 |
| Superbase Personal Database | £99.95 |
| Normally £299.85 OFFER PRICE | £199.95 |

**IMAGE PROCESSING PACK**

| | |
|---|---|
| Digipic Digitiser | £343.85 |
| Pixmate Image Processor | £49.95 |
| Baxall Video Camera | £229.95 |
| Normally £623.75 OFFER PRICE | £499.95 |

**PRINTLINK**
Allows AMIGA to use CBM Serial or Standard Centronics Printers, with the Bonus of a 60K Buffer.
CBM Serial only ........ £34.95
CBM Serial plus User Port to Centronics ........ £44.95

**THE NEW STAR LC10 DOT MATRIX PRINTER**
* 120 cps Draft, 30 cps NLQ
* Friction and Tractor Feed
* Paper Parking Facility
* 6 Resident Fonts and 6 Different Print Pitches Selectable from Front Mode Select Panel

Commodore Serial or Centronics ........ £199.95
Commodore 64/128 Colour Version ........ £229.95
Including FREE GEOS worth £26.95 with CBM version

**1541C DISC DRIVE** ........ £169.95
**OCEANIC OC 118N** ........ £129.95
Commodore Compatible Disc Drive
Both include GEOS, plus either:
**Software Pack A**
6 Disc Adventure Games plus 5 Disc Arcade Games
**Software Pack B**
Easyfile Database, and Future Finance Planning Package

**SUPER G**
CBM to Centronics Printer Interface ........ £34.95
**FINAL CARTRIDGE 3** ........ £39.95
**MPS 803 TRACTOR FEED UNIT** ........ £29.95
**CBM 64/128 MUSIC EXPANSION SYSTEM**
Including Keyboard, Synthesiser and Software ........ £75.00
**COMPOSER/EDITOR SOFTWARE**
For Music Expansion System, Tape or Disc ........ £24.95
**ACTION REPLAY Mk IV**
Tape to Disc Back-up Cartridge ........ £29.95
**NEOS MOUSE**
With CHEESE Software, Tape or Disc ........ £24.95
**COMMODORE C2N DATA RECORDER** ........ £29.95

**PRINTER RIBBON OFFER**

| | |
|---|---|
| MPS 801, 802, Citizen 120D and Star NL10 Ribbons | £5.95 |
| MPS 803 & MPS 1000 | £4.95 |
| DPS 1101 Multi Strike | £3.50 |

BUY FOUR AND GET ONE FREE!

**REMARKABLE COMMODORE PC1 OFFER**
Unbeatably priced PC/XT compatible, including extremely compact base unit, detachable keyboard and monitor. Compatible with all major PC/XT software, the PC1 now represents the lowest price for specification PC compatible in the UK.
* 8088/4.77MHz Processor
* 512K RAM
* Serial and Parallel Ports
* MSDOS 3.2 and GW Basic included

For a limited period, the PC1 also includes ABLE ONE Integrated Spreadsheet, Wordprocessor and Database package (usual price £113.00)
PC1 with Mono Monitor ........ £299.99 + VAT
PC1 with CGA Colour Monitor ........ £449.00 + VAT
PC1 Package without Monitor. Compatible with CBM 1084 and most CGA/Hercules monitors ........ £269.00 + VAT

**CITIZEN 120D DOT MATRIX PRINTER**

| | |
|---|---|
| Commodore version (with 64/128 Printer Lead) | £159.95 |
| Centronics version (with AMIGA Printer Lead) | £159.95 |
| Commodore 1901 Colour Monitor | £219.95 |
| Philips 64/128 Green Screen Monitor | £89.95 |
| MPS 1200P Dot Matrix Printer, Centronics | £219.95 |
| MPS 1500C 7 Colour Dot Matrix, Centronics | £339.95 |
| 1581 3½" Disc Drive including 10 x 3½" Discs | £199.95 |

**PRECISION**

| | |
|---|---|
| Superscript 64 | £24.95 |
| Superbase 64 | £24.95 |
| Superscript 64 & Superbase 64 | £44.95 |
| Superscript 128 | £29.95 |
| Superbase 128 | £29.95 |
| Superscript 128 & Superbase 128 | £54.95 |
| Superbase, The Book | £11.95 |

**GEOS Version 1.3**
CBM 64/128 Operating System
Including: Desktop, Geowrite, Geopaint, and Desk Accessories, Disc
CBM64 ........ £26.95
CBM128 ........ £34.95

**GEODEX/DESKPACK**
Combined Database with powerful Mailmerge function. Also contains Artgrabber Graphic Images, Calendar and Icon Editor ........ £21.95

| | |
|---|---|
| **GEOCALC** Spreadsheet | £24.95 |
| **GEOCALC 128** | £34.95 |
| **GEOPUBLISH** Desktop Publisher | £34.95 |
| **WRITERS WORKSHOP** | £21.95 |
| **WRITERS WORKSHOP 128** | £34.95 |
| **FONT PACK 1** | £16.95 |
| **GEOFILE** Database | £24.95 |
| **GEOFILE 128** | £34.95 |
| **GEOSPELL** Spellcheker | £16.95 |

**I CONTROLLER***
Geos-compatible Joystick. Fits onto keyboard ........ £12.95
*FREE OF CHARGE WITH PURCHASES OF TWO OR MORE GEOS PACKAGES

**CBM 64/128 and PLUS 4 COMPANIES PACK**
Sales/Purchase/Nominal Ledgers with Invoicing and Stock Control, Disc ........ £24.95

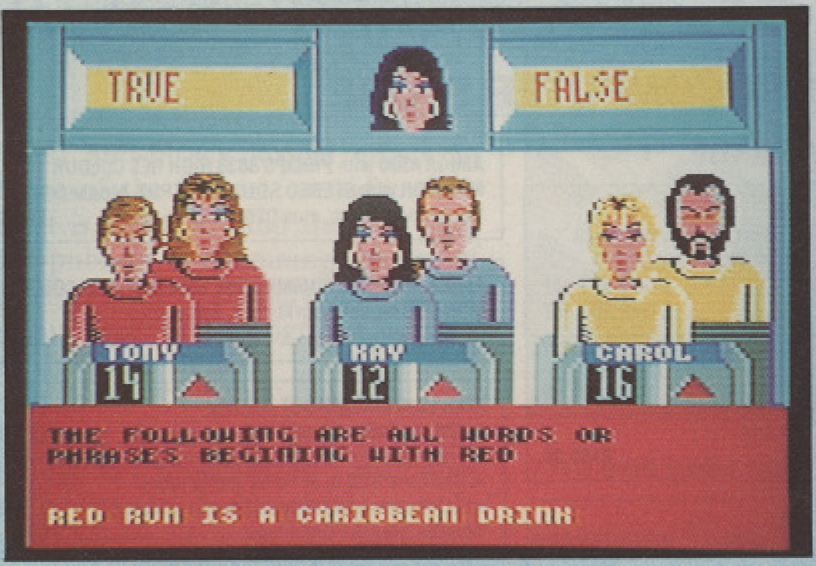
**PERSONAL CALLERS AND EXPORT ENQUIRIES WELCOME**
ALL OFFERS STRICTLY SUBJECT TO AVAILABILITY
ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE
ALL PRICES INCLUDE VAT UNLESS OTHERWISE STATED

To order, either send cheque/P.O. with coupon or ring **(0533) 517479/21874** with Access/Barclaycard number. Please allow 7 working days for delivery from receipt of order or cheque clearance.
Please add £1.00 towards carriage and packing on any software order.
Hardware orders add £1.00 under £65.00 value, and £5.00 over £65.00 value.
Printer orders add £5.00 towards carriage.

Send to: Dept. No. YC 9, Dimension Computers Ltd., 27/29 High Street, Leicester LE1 4FP.
Tel: (0533) 517479/21874 Fax: (0533) 511638

| Item | Quantity | Price |
|---|---|---|
| ........ | | |
| ........ | | |
| ........ | Total | |

Name........
Address........
........
Telephone:........




computer game.

You've seen the posters featuring a leopard skin clad, whip wielding Corrinne Russell, alias *Vixen*, now you can play the she-wolf in Martech's latest game. The game is supported by some rather dubious assumptions such as the dinosaurs which still rule the planet of Granath. The sole human survivor is Vixen, a girl brought up by foxes that possess magic powers, that a whip can fell a dinosaur and the Vixen can turn into a fox and back into her human form complete with jewellery, lipstick, nail varnish and hair style. If you believe that lot then you'll probably think this is a good game, that politicians always tell the truth and hype makes a game worth buying.

If you're looking to be a hero then why not step into the sandals of *Hercules, Slayer of the Damned* in Gremlin's

# Games Update

*TV game shows, board games, coin-op conversions, wargames and budget releases combine to form this month's new game releases*

The latest TV game show to be released by Domark in their TV Games Series is *Every Second Counts* in which three couples compete through true or false questions to gain seconds of time. The winners of this section then use their clock in the final game to build up a high score.

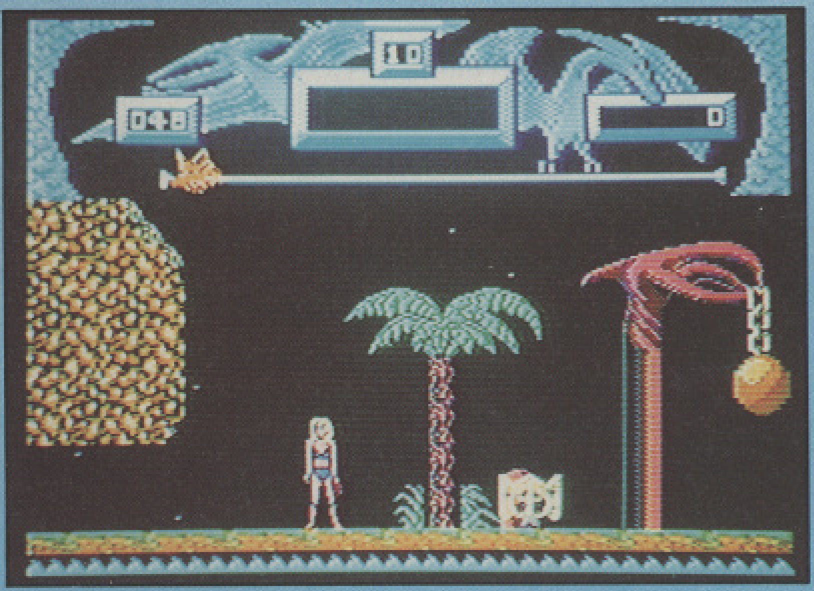
The game follows the Paul Daniels show quite closely, even down to the bonus rounds where you get ten seconds to answer a question. If you answer it in one you collect ten seconds and probably the lead.

In the final you must provide four, five, six then seven correct answers within the time set by your clock. Unfortunately, there aren't any prizes to be won; instead you must be satisfied with setting a high score. In the words of the quiz master. "You'll like it, but not a lot!".

*Deluxe Monopoly* is Leisure Genius' second attempt to simulate the world's greatest board game and is a vast improvement. Now you can actually see the board, the pieces and through a window at the bottom of the screen you can get details of the properties as you move over them.

A command bar at the top of the screen allows you to build houses and hotels, check who owns what, claim rent from players who land on your land, quit or save the game, check the player's cash levels, offer a trade or throw the dice to move.

The only problem that I could find with this good but floored computer version is that computer opponents will continue to offer you ridiculous trades even after you've turned them down countless times. Deals in which you are offered a pointless property for one that would make up a set for your computer opponent and you have to pay some money for the privilege. This simply slows the game down but shouldn't put off Monopolites looking for a



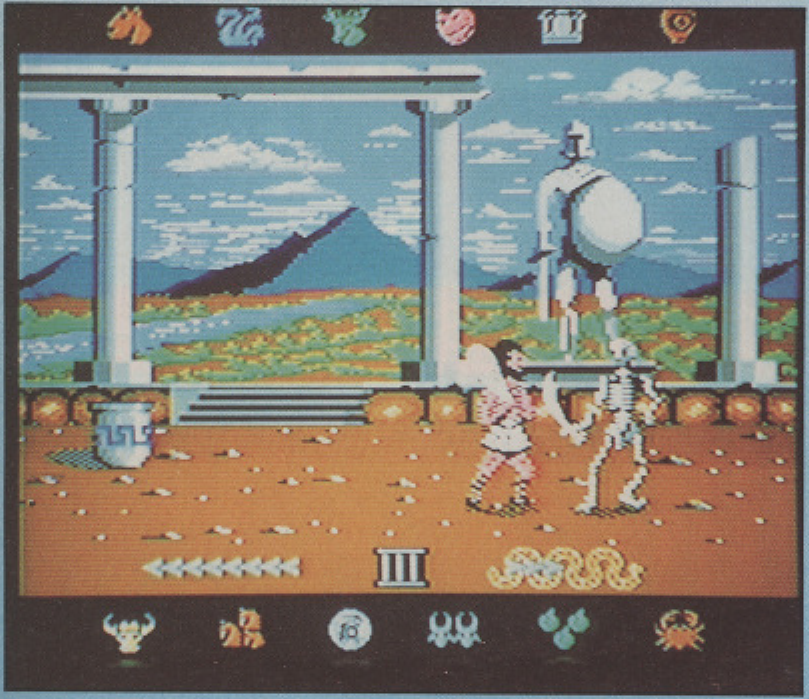

latest offering. Hands up all those that think that a combat game featuring the labours of Hercules would have him battling heroically against the Nenean Lion, Hydra, Cretan bull and others in a twelve part game. Well you'd be wrong as these massive creatures and tasks are reduced to smokey icons that must be collected while Hercules fights a series of skeletons!

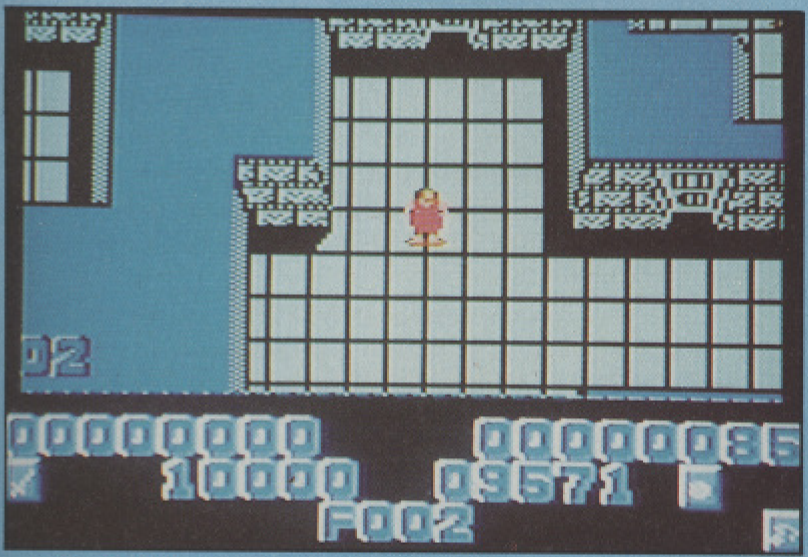
Grandslam's *Flintstones* was first released on the Amiga and has now appeared on the C64 and features you as Fred. You want to go bowling with Barney but Wilma has other ideas and as the gáme begins you must paint the living room wall while babysitting for Pebbles. After this disappointing start, what have we done to deserve another painter program, the game picks up with a reasonable bowling simulation and then falters again when

you attempt to rescue Pebbles who has wandered off and was last seen on a high girder on the local building site!

Another disappointing game was the C64 version of *Shackled*, US Gold's Data East Gauntlet clone. The object of the game is to enter a mysterious castle and free your comrades that are held prisoner.

The dungeon levels appear in an almost top down format whereas the characters and their gaolers would be more at home in a sideways scrolling game. The resulting display combined with a scrolling routine that ensures that you can't see where you're going results in a game that's almost impossible to play.





US Gold's *Desolator* is a conversion of the Sega coin-op game Halls of Kairos in which you must punch and kick your way through the castle of Kairos to rescue the infants held behind mysterious mirrors. Throughout your quest your path is blocked by Kairos' henchmen as well as mines and giant rolling barrels.

Cassette owners can at last explore the magical world of the *Bard's Tale* and send parties of adventurers to delve into the mysteries that lie in and below the town of Skara Brae. It's a town trapped by an eternal winter spell cast by the evil Wizard Mangar.

Armed with a few magical songs the Bard is ready to take on all comers as long as he has the help of a couple of fighters, a thief to find secret doors and at least one of the four types of magic user, conjurer, magician, sorcerer and wizard. The game features 128 different monsters waiting to chomp you, a 3D town to explore, 16 levels of dungeons and 85 different spells to wield. A must for roleplayers. Disk users should turn to page 35 to catch up on the latest installment, *Bard's Tale III: The Thief of Fate*.

SSI's *Shiloh* is a fascinating struggle that recreates the first real test for General Grant as his 45,000 men were caught by the Tennessee river in a surprise attack by General Johnston's Confederate forces.

In a three level battle you can build up your wargaming experience from the joystick controlled beginners game to the advanced level that includes additional rules and details that cover the actual leaders themselves, morale of untried troops and the gunboats Lexington and Tyler.

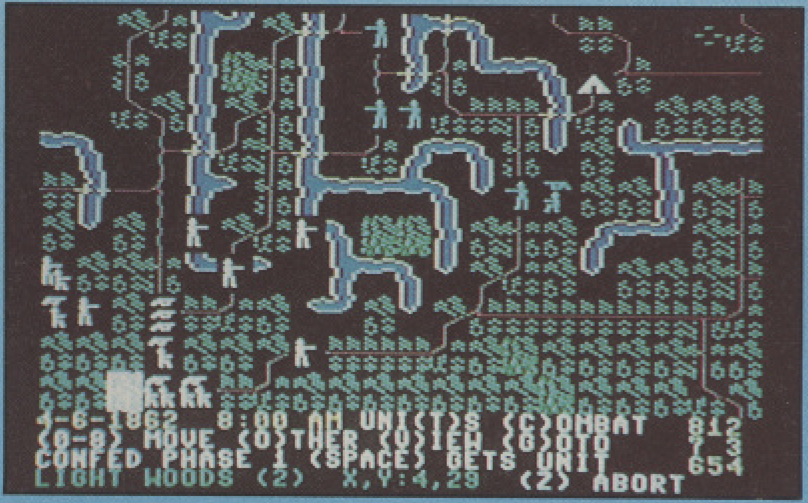
To help out a would-be general, you can display the units either as standard wargame symbols or as icons showing infantry, cavalry and artillery, swap between a large scale scrolling battlefield and to help you with your combat orders pressing a single key highlights everything in that unit's field of vision.

Once you've mastered the basic game you can customise Shiloh by adding hidden movement and restricting ammo and the efficiency of either side, so it will remain a challenge.

SSG, the Australian wargamers has signed a deal with Electronic Arts which means that games such as Decisive Battles of the American Civil War, Halls of Montezuma and now recently Rommel are available from EA for about half the former import price.

For just £18.95 the player will get a game disk containing on average six scenarios, a 72 page manual, colour scenario maps, labels for your save game disks and cards that guide you through the game's menus.

The first batch of releases include *Decisive Battles of the American Civil War* (volume 1), the naval wargame *Carriers at War*, *Europe Ablaze* which simulates the five year struggle for air superiority in World War II, six battles that describe the history of the US Marines from Mexico in 1860's to WWII island assaults in *Halls of Montezuma* and now *Rommel*.




*Rommel* uses the menu driven Battlefront game system and recreates seven of Rommel's great battles in the deserts of North Africa and an eighth hypothetical invasion of Malta. The computer can take either side in a battle that is fought for key objectives such as towns, hills and airfields that are worth victory points for each turn you hold them. Unlike other wargames where you must move every single unit *Rommel* and other SSG titles gives you realistic control as you simply assign objectives to the regiments in your

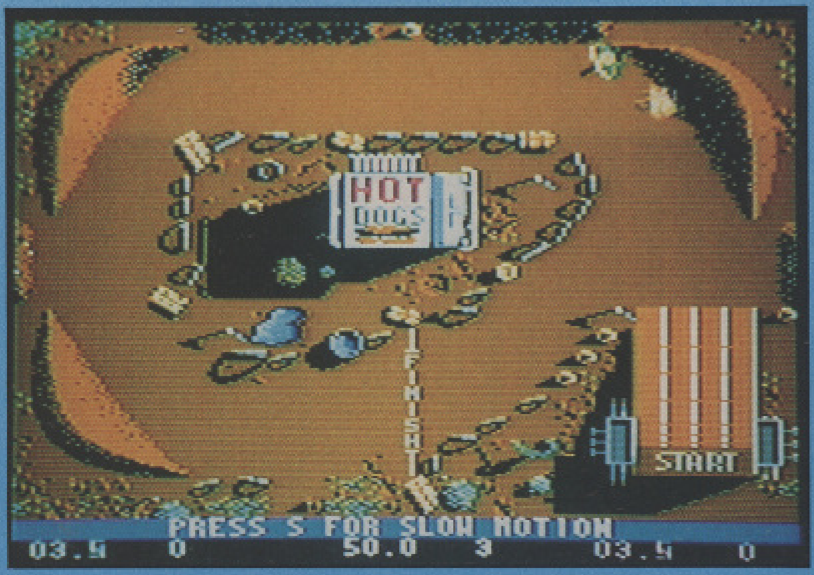



divisions leaving the computer sub commanders to do the ground work.

This still leaves you with plenty to do from assigning objectives to reserves and air support to defining whether a unit will probe, assault, defend or exploit when in attack.

## BUDGET SOFTWARE

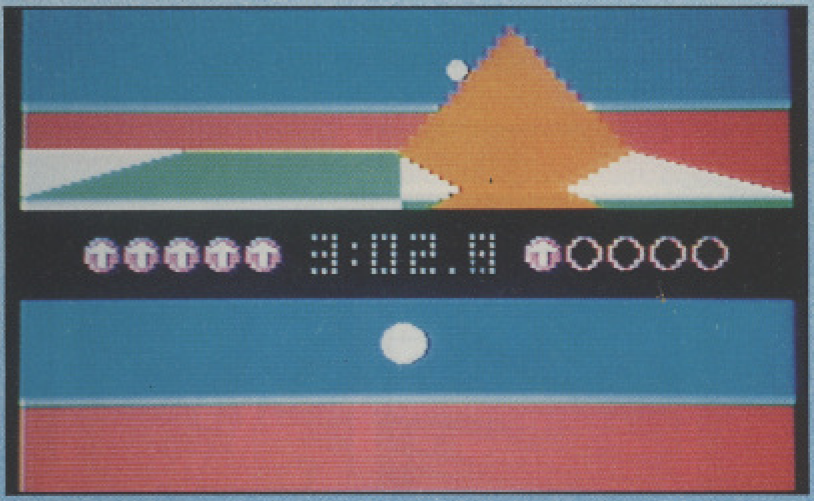
Code Masters has once again upped the stakes in the budget software battle by releasing the first in a range of budget games on disk. The first release is the tape based classic *BMX Simulator* now available on disk for only £2.99! Seven courses packed full of ramps, bumps and bike busting barriers wait to challenge one or two BMX bikers.




*Beach-Head,* the multi-stage action game that started a whole trend in software has been reissued as part of Mastertronic's Americana label. One or two players can take on the dictator's forces through a series of battles from an aerial assault on your fleet, a gun battle with enemy ships, a land battle as your tanks hit the beaches and then a final conflict as you attempt to destroy his fortress before he gets you.

*Ballblazer* is quite simply one of the best future sports games you will ever play. It was one of the first Lucasfilm games released in the UK by Activision and is now part of Mastertronic's Riccochet label.

Each player controls a rotofoil that hurtles around the arena attempting to shoot the plasmorb ball into the opposing goal that moves across the base line. The action is fast and furious and so the game includes up to nine



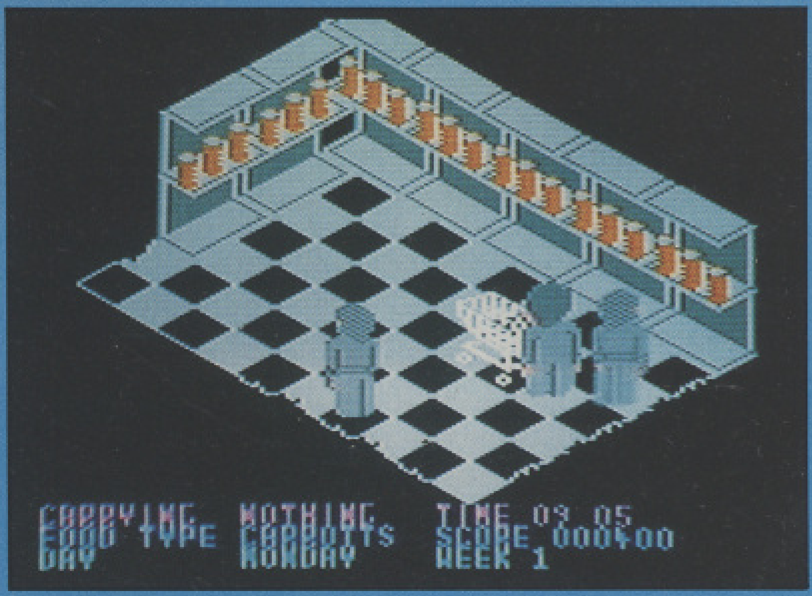
droid opponents in case you haven't a human who can stand the pace.

*Super Trolley* is the game designed by Andrew Collett, programmed by Icon Design and published by Mastertronic all as the result of Andrew's letter to Jim'll Fix It. In the game you are a general dogsbody in a supermarket and must wheel your trolley around the shop to collect the goods to restock the shelves while avoiding the customers. Hit too many and you'll be sacked.

*Poltergeist* is the latest 'blast everything that moves' game from Code Masters that plays like a cross between Scramble and Nemesis and based on an incredibly tacky scenario claiming the existence of haunted planets that must be cleared by your Exocist ship. Still it provides good shoot 'em-up value for only £1.99, but don't expect anything original.

Finally, *Droids* (Mastertronic MAD) features the Star Wars Droids C3P0 and R2D2 in a puzzle solving sideways scrolling adventure. They've been captured by the Fromms (painful) and must now escape through your skill in controlling C3P0 and R2D2's ability to plug in and control the Fromm's computer systems.

**Tony Hetherington**



## commodore

### AMIGA — FROM £425!

| | |
|---|---|
| Amiga A500 with 512K RAM, 880K 3.5" disk, mouse, software | £425 |
| Amiga A500 TV As above, plus A521 TV/composite modulator | £445 |
| Amiga A500M with A1081 high-res colour monitor | £675 |
| Amiga B2000 with 1MB RAM, 880K 3.5" disk, mouse, software | £999 |
| Amiga B2000M As above, plus A1081 hi-res colour monitor | £1245 |
| Amiga B2000 XTM As above, plus PC XT bridge board & floppy | £1745 |

**Add £50 for A1084 in place of A1081. Prices include 15% VAT, a FREE copy of DeLuxe Paint, FREE delivery to your door, one year warranty. Overnight delivery £12 On-site maintenance option available.**

### AMIGA PERIPHERALS

| | |
|---|---|
| A521 TV/composite modulator | £25 |
| 512K plug-in RAM/clock (A500) | £99 |
| A1081 high-res colour monitor | £275 |
| A1084 high-res colour monitor | £325 |
| A1010 3.5" external disk drive | £185 |
| Cumana 3.5" external disk drive | £129 |
| NEC internal drive (2000 only) | £129 |
| A2010 internal drive (2000 only) | £175 |
| Genlock B2000 video controller | £225 |
| A2052 2MB internal RAM card | £375 |
| A2088 PC-XT bridge board with 5.25" internal disk drive | £499 |
| A2286 PC-AT bridge board with 5.25" internal disk drive | £699 |
| A2092PC 20MB internal hard disk with MS DOS controller | £525 |
| A2092A 20MB internal hard disk with Amiga DOS controller | £625 |
| A2094A 40MB Amiga Dos hard disk | Call |
| Supra hard disks 20MB - 250MB | Call |
| Citizen 120D 120 cps, F/T, NLQ | £185 |
| Star LC10 120 cps, F/T, NLQ | £225 |
| Precision printer 480 cps, NLQ | £399 |
| Canon PJ1080A colour, 80 dpi | £499 |
| Xerox 4020 colour, 240 dpi | £1125 |
| HP LaserJet laser, 300 dpi | £1995 |

### AMIGA CREATIVITY

| | | |
|---|---|---|
| De Luxe Paint II (PAL) | | £59.95 |
| DigiPaint 4096 colours | | 39.95 |
| De Luxe Music (PAL) | | 59.95 |
| Page Setter | | 94.95 |
| City Desk | | 89.95 |
| Animator Apprentice | | 179.95 |
| ProWrite | Wordprocessing fully integrated with graphics | 89.95 |
| VizaWrite Desktop | High performance desktop publishing wordprocessor | 79.95 |
| Word Perfect | Amiga version of the No.1 best selling wordprocessor | 199.95 |
| The Works | Analyze + Organize + Scribble, integrated desktop | 139.95 |
| Publisher Plus | Enhanced version of the original desktop publisher | 99.95 |
| Flow | The Idea Processor from New Horizons Software | 69.95 |
| PixMate | Professional image enhancement straight from NASA! | 44.95 |
| Prism Plus | 4096 HAM colour paint pack 1024 x 1024 (needs 1MB) | 54.95 |
| Calligrapher | Professional font editor, fonts up to 160 x 256 pixels | 74.95 |
| De Luxe Video II | Create all types of video presentations with ease | 59.95 |
| Aegis VideoScape | Full 3D animations in all resolutions with overscan | 124.95 |
| Pro-Video CGI | Professional video titler with fonts, extra fonts available | 159.95 |
| Aegis Animator | Full storyboarding package, includes Aegis Images | 94.95 |
| TV Show | PAL image presentation in IFF or HAM with overscan | 89.95 |
| DigiPic | Fast frame-grabber, 32 colours or grey scale | 299.95 |
| Art of Chess | The best Amiga chess yet, packed with features | 24.95 |

### AMIGA PRODUCTIVITY

| | | |
|---|---|---|
| SAM Basic | | £89.95 |
| A/C Basic | | 154.95 |
| A/C Fortran | | 229.95 |
| Lattice C 4.0 | | 144.95 |
| Lattice C Professional | | 299.95 |
| MCC Pascal | | 69.95 |
| 64 Emulator | Use your C64 programs and files! Includes cable | 69.95 |
| SuperBase Personal | Relational database power, without programming! | 79.95 |
| SuperBase Professional | With Forms Editor and DML program language | 194.95 |
| Acquisition (V1.3) | Relational database with programming language | 224.95 |
| Maxiplan 500 | Ultimate Amiga spreadsheet, + text/graphics/speech | 89.95 |
| Maxiplan Plus | As Maxiplan 500 above, plus powerful Macro language | 129.95 |
| VIP Professional | 1-2-3 compatible spreadsheet + database & graphs | 99.95 |
| Logistix | 2048 x 1024 spreadsheet, database, graphs & calendar | 99.95 |
| Businessware Pack 1 | Invoicing, Sales Ledger, Stock Control, by Panmead | 159.95 |
| Businessware Pack 2 | General Ledger, Purchase Ledger, by Panmead | 159.95 |
| Intro Cad | Entry level CAD package, printer or plotter output | 54.95 |
| Aegis Draw Plus | Comprehensive CAD with multiple layers & windows | 124.95 |
| X-Cad | Professional CAD system (needs 2MB) | 424.95 |
| MCC Assembler | Professional development system with linker & libraries | 59.95 |

### 128

| | | |
|---|---|---|
| Commodore 128D | | £399 |
| Commodore 128 | | 199 |
| NEW 1581 disk drive 3.5" | | 199 |
| Commodore 1571 disk drive | | 199 |
| Commodore 1541C disk drive | | 169 |
| NEW Commodore PC-III | | Call |
| SuperBase 128 | | £29.95 |
| SuperBase 64 & Plus/4 | | 24.95 |
| SuperBase: The Book | | 11.95 |
| SuperBase Starter 64 | | 14.95 |
| SuperScript 128 | | 29.95 |
| SuperScript 64 | | 24.95 |
| VizaWrite 128 Classic | | 59.95 |
| VizaWrite 64 (disk) | | 39.95 |
| VizaWrite 64 (cartridge) | | 49.95 |
| VizaStar 128 | | 79.95 |
| VizaStar 64 XL8 | | 59.95 |
| VizaStar 64 XL4 | | 49.95 |
| PetSpeed | Oxford Systems' best selling Basic compiler (state 64/128) | 19.95 |
| Oxford Pascal | Complete J & W Pascal, with extensions (state 64/128) | 19.95 |
| Oxford Pascal 64 (tape) | As above, for C64 tape users | 19.95 |
| Cobol | Complete COBOL package from Abacus (state 64/128) | 29.95 |
| Super C | Complete C language to K & R standard (state 64/128) | 39.95 |
| Hack Pack | All-in-one programmer's Toolkit/Ram-disk (state 64/128) | 19.95 |
| Oxford Basic 64 | All-in-one Basic compiler, Toolkit, compressor | 19.95 |
| 1750 Expansion RAM | 512K Expansion RAM cartridge for the C128 | 149.95 |
| RamDos 128 | Lightning-fast RAM-disk for 512K expansion RAM | 29.95 |
| 1764 Expansion RAM | 256K Expansion RAM cartridge for the C64 | 99.95 |
| Anatomy of the 128 | The 500-page insider's guide to the 128 | 9.95 |

**IF YOU WANT IT TOMORROW... CALL US TODAY! ON 0483 - 504125**

Prices are POST FREE & include VAT. Order by phone with your credit card, or send cheque/PO or your credit card number. Official orders welcome. We despatch same day by FIRST CLASS post. Please allow 5 days for delivery of hardware orders. Prices quoted are subject to availability. Ref. A56

VISA

**Calco Software**

LAKESIDE HOUSE, KINGSTON HILL, SURREY, KT2 7QT. TEL 01-546-7256



## RS232 INTERFACE 64, 128 or Plus/4* ...£34.99

Measuring only 12x69x57mm, the smallest and neatest unit available. Conforms to Commodore 1011A user-port standard. Compatible with BASIC, Easyscript, Superscript, Superbase, Mini Office, Script Plus etc. Connect to RS232 printers, modems and other devices. Supplied with 1 metre of cable (add 75p extra metre*) terminated with a male (female*) 25-way D-connector, or a custom cable made to your requirements. Our after sales service for unusual printers guarantees to get you up and running. Supplied with a terminal emulator program, file transfer and other utilities on **tape/disk***

## IBM PC File Transfer Utility ..............£9.99

Captures text or binary files via the COMI RS232 port. Supplied on a 360k IBM format 5¼" disk. Simple instructions provided by on-line help.

## VIEWDATA TERMINAL 64 or Plus/4 ....£14.99

Access Prestel, Micronet, CityService etc. Works with any user-port RS232 interface and 1200/75 modem.

## CENTRONICS CABLE 64, 128 ..........£18.99

Compatible with Easyscript, Superscript etc. Driver for BASIC on disk or tape*.

## 6502 ASSEMBLER 64 or Plus/4* tape/disk £12.99

A sophisticated two-pass symbolic assembler and text editor which supports tape and disk filing. The assembler, editor, source and object code may all be resident in memory simutaneously, facilitating rapid and interactive code development. Very fast edit/Assembler/test cycles.

## Z80 EMULATOR/ASSEMBLER 64 disk £12.99

A unique integrated Z80 development package. The emulator compiles Z80 source code into optimised 6502 which runs on the 64 at about one sixth the speed of a 2MHz Z80. The cross-assembler generates hex or binary Z80 object files. The disk contains a powerful editor and example programs.

***Please specify* options. Send cheque/PO. or order by access. Prices include VAT and P&P. Overseas orders add £2.50. Allow up to 1 week for delivery.***

**YORK ELECTRONIC RESEARCH**

**The Fishergate Centre, Dept YC, 4 Fishergate, York YO1 4AB Tel (0904) 610722**



### OFFICIAL COMMODORE/AMIGA DEALER

| | |
|---|---|
| **COMPUTERS** | |
| Amiga 2000 + 1084 Colour Monitor | 1348.95 |
| Amiga 2088 PC/XT Bridgeboard + 5.25" Drive | 481.85 |
| Amiga 500 | 369.00 |
| Amiga 500 + Commodore 1084 Colour Mon | 619.00 |
| Amiga 500 + Philips 8833 Stereo Colour Mon | 619.00 |
| Commodore 128D Desktop | 379.00 |
| Commodore 128 + C2N Cassette | 219.00 |
| Commodore 64C Olympic Pack | 139.95 |
| **PRINTERS** | |
| Citizen 120D Parallel or Commodore | 149.95 |
| Star LC-10 Parallel or Commodore | 199.00 |
| Star LC-10 Parallel or Commodore Colour | 219.00 |
| Star LC24-10 24 pin Multi-font 170/57cps | 329.00 |
| Okimate 20 Text & Multi-colour Graphics for Amiga | 148.95 |
| **MONITORS** | |
| Commodore 1084 Colour Monitor inc lead | 259.00 |
| Philips 8833 Stereo Colour Monitor inc lead | 259.00 |
| Philips 7502 Green Screen Monitor inc lead | 85.00 |
| **MISCELLANEOUS** | |
| Amiga 2092 PC 20Mb Hard Disk Drive | 493.35 |
| Amiga 501 512K RAM/Clock Expansion | 119.00 |
| Pace Modem + S/ware for Amiga V21/23 Prestel, BBS etc. | 239.00 |
| Commodore 1541C Disk Drive | 159.00 |
| Commodore 1571 Disk Drive | 189.00 |
| Commodore 1581 3.5" Disak Drive | 189.00 |
| Commodore C2N Data Recorder | 29.95 |
| Cumana CAX354 Disk Drive | 99.95 |
| Power Supply for C64 | 26.45 |
| Super-G Cent I/F + Graphics C64/128 | 34.95 |
| Surge Protector 13A Plug | 12.95 |
| Surge Protector 3-Way Adaptor | 15.95 |
| Amiga DOS Reference Manual | 22.95 |
| C128 Official Prog's Ref Guide | p&p £2 18.95 |
| **SOFTWARE** | |
| Superbase Personal | 79.00 |
| Superbase Professional | 187.00 |
| VizaWrite 128 + Spellcheck | 59.95 |
| Superbase 128 | 29.95 |
| Superscript 128 | 29.95 |
| Tasword 64 40/80 Col WP - Tape/disk | 17.95/19.95 |

**Prices subject to change without notice** **E&OE**

**ALL PRICES INC. VAT. CARRIAGE £8. EXPRESS DELIVERY £12**
**Software & Small items FREE**

## Delta Pi Software Ltd

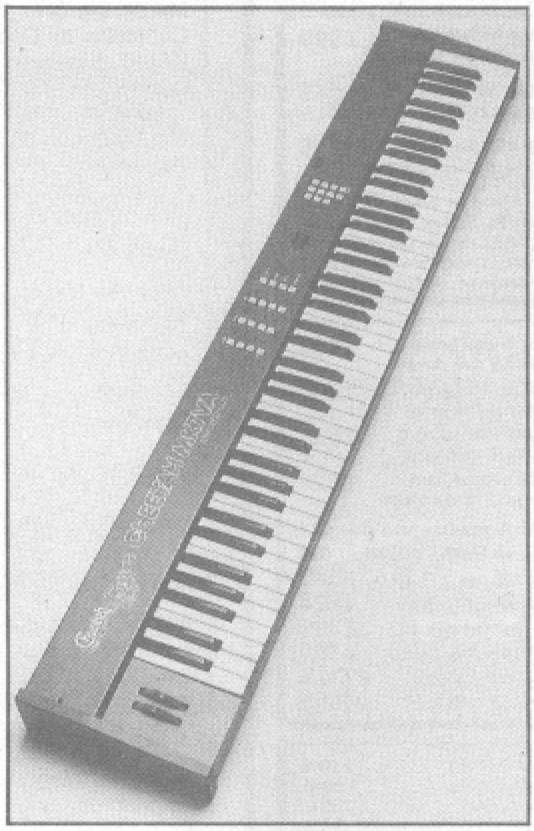
8 Ruswarp Lane, WHITBY, N. Yorks. YO2 1ND.
Tel: 0947 600065 (9am-7pm)

# Music with Midi

*Getting to grips with MIDI*

***By Darrin Williamson***

We've all heard and probably used the term MIDI in an everyday context. It has become the buzzword of the 80s for small but perfectly formed pieces of electrical hardware (e.g. Midi Hi-Fi). MIDI has a second meaning in musical circles in that it represents a musical processing protocol for the majority of electronic musical instruments currently under manufacture.



## Understanding MIDI

MIDI stands for Musical Instrument Digital Interface and was co-invented by the head honchos at Roland, Yamaha and Sequential Circuits. This represents an astonishing achievement in consumer electronics. Not for technical reasons but purely because it's one of the few instances in history where Japanese, European and American electronics manufacturers have sat down and agreed to a single set of standards in which everyone conforms to (pretty remarkable, I trust you'll agree!).

## The MIDI Concept

So MIDI is actually a two part concept; firstly it is a communications language and secondly an interface which interprets and converts the codes into musical output.

The MIDI protocol consists of 16 independent channels which can best be explained as being similar to transmission and reception on a C.B. radio. A MIDI interface transmits numbers; information about what note or notes have been hit and what characteristics (duration, velocity, volumes, etc) these notes have. This data can then be sent to any or all of the 16 MIDI channels.

Therefore you can route, say, a bass line to a specific sound unit by setting your input device to transmit on, for instance channel 10 and set the device you wish to respond to the same channel. Then only one device will "play" the bass line, rather like a CBer talking on a specific line frequency. If, however you wanted to send one musical phrase to a whole multitude of synths then you can either set all your output devices to the same receive channel or set your input device to transmit on all channels (AKA "Omni mode").

This may sound a bit complicated but it's just the same principle as if you had linked two Commodores together with a comms package. Hitting the letter A on one micro would reproduce the same letter on the receiving machine. It's not the actual letter that has travelled down the lead but the ASCII number that represents that letter which both machines understand. Likewise with MIDI, if you link two synths together in much the same way playing middle C on one will result in the other responding with the same note. Again the sound hasn't been transferred but a numerical representation (in this instant E60) of it that anything MIDI equipped will interpret correctly.

## Getting into MIDI

So what basics do you need for MIDI? Firstly you need something to generate the codes. The obvious choice is some form of synthesiser as this will not only give you the keyboard input you require but access to some playback sounds when the composition is complete. When choosing a synth you really need one with as many performance controls on it as possible (e.g. pitchbend, modulation, after touch etc), and some form of touch sensitivity as most sequencers accept sensitivity and performance data as do most sound modules these days.

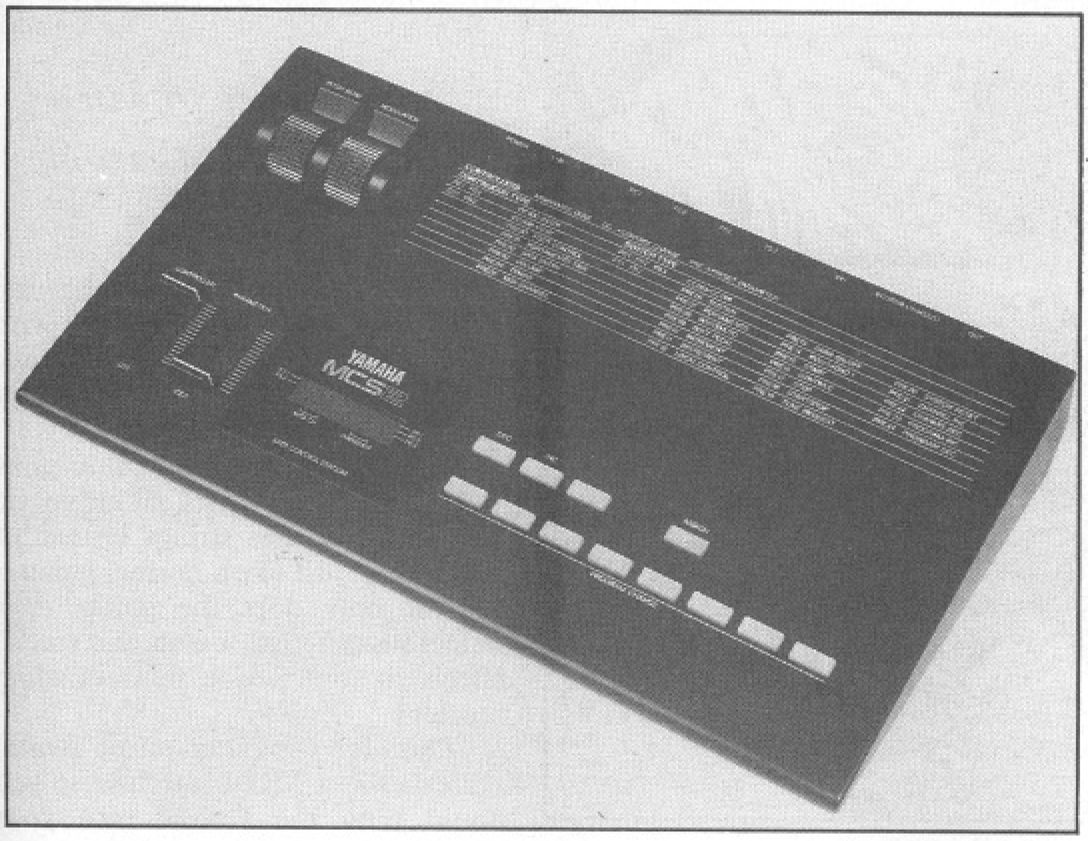
Ideally the synth should also be equipped with MIDI mode 4, otherwise known as "mono mode". This allows you to assign a different sound to a different MIDI channel thus giving the illusion of having up to 16 synths depending on how polyphonic the keyboard is, e.g. if the synth is eight voice polyphonic (eight notes can sound at the same time) so if you assign a separate sound to a separate channel the maximum number of sounds you will be able to extract from that machine is eight.

The most cost effective synths around come from Casio. Most economic is the CZ-101 which now retails for around £200 (provided you shop around) or the CZ-230S which is non-programmable but offers built in drum patterns. Both units have pitch band wheels but non touch-sensitive small keyboards which will inhibit those of you (like me!) with big paws. Pricewise you can spend as much or as little as you want. Thanks to keen competition, an extra £100 will get you extra valuable benefits.

## You're so Masterful!

Alternatively you could opt for a MIDI master keyboard, which has all the performance features of a top-of-the-range synth without the voices. You may be wondering what the point of that would be. It depends on how complex your set-up is likely to be.

If, for instance your system is likely to consist of several sound modules (keyboardless synths) then you will be able to control each module more efficiently as most master keyboards allow you to route different MIDI channels and map them onto different areas of the keyboard. For instance, you could split the keyboard so that the bottom octave was sent to a synth running a bass sound, the middle two octaves driving a string sound on a different MIDI channel to a different module and so on. Once your keyboard split points are configured the way you want them, you can then




store the whole thing as a memory patch that can be recalled at a later date.

As with synthesisers you can spend virtually any amount of money on a mother keyboard. The best value range in the category comes from Cheetah Marketing (best known for producing add-ons for a certain rubbery keyed micro). Prices start from £200 for the basic model rising to £400 for the seven octave, touch sensitive, weighted keys and three programmable split points. Personally I would recommend the mid-priced model in the range, the MK5V which offers five octaves of touch sensitive keys and both pitch bend and modulation wheels. This models goes for about £275.

Another up and coming use of computers and MIDI is that of voice editing. Most synths are quite tricky to alter sounds on. Largely due to the unfriendly front panels on most synths. Therefore a more comprehensive front end can be displayed on screen, sounds can be edited on screen and sent back to the synth.

Furthermore, once you've started building up libraries of sounds they can be stored database style onto tape or disk which is much more reliable than synths internal save to tape to routines, not to mention quicker (yes folks there is something slower than a 1541!).

So, to sum up, it seems clear that there's an awful lot of things you can do with the combination of MIDI and your computer. They say there's a best selling novel in all of us so maybe there's a number one single in there too. Perhaps the current level of technology is high enough to extract talent from everyone.

## Choose your Weapon

All well and good if you know your way around the ivories but that's of no use if you play something else instead. Fortunately there are also a number of alternatives in the shape of MIDI equipped guitars (from Roland and Casio), basses (from Roland), drum pads (from Roland, Casio, Yamaha and Simmons) and wind instruments (from Akai and Yamaha). All these products do much the same sort of job in as much as they all convert a musical action (pluck of a string, press of a key) into those all important MIDI codes.

There are even units that take a vocal input and convert them into MIDI codes. Syco Systems have developed a pitch tracker although you will be looking at paying thousands of pounds rather than hundreds for one of those. More within our price bracket is the Korg Voice Processor which is the MIDI equivalent of a Vocoder which allows you to talk or sing through notes played from a MIDI sound source which can produce some interesting effects. Anne Dudley of the Art of Noise swears by them.

So we've established that pretty much whatever instrument you feel comfortable with you can start unleasing MIDI codes into an unsuspecting Commodore. What do you mean big deal? Perhaps you haven't heard just what sort of things with a computer and a MIDI interface.

## Computer Control

What could be better at gathering in numbers, storing them and, where required manipulation of numbers than a computer, particularly one as spiffing as a Commodore – right kids?

First thing you need here is some form of MIDI Interface – a box that converts MIDI signal into a form which a computer can understand and then change them back again. Sequencing has been the main use of computers in music for both home users and studio professionals alike. Performer/Producers like Stock, Aitkin and Waterman wouldn't create the songs they do without a little help from a micro here and there.

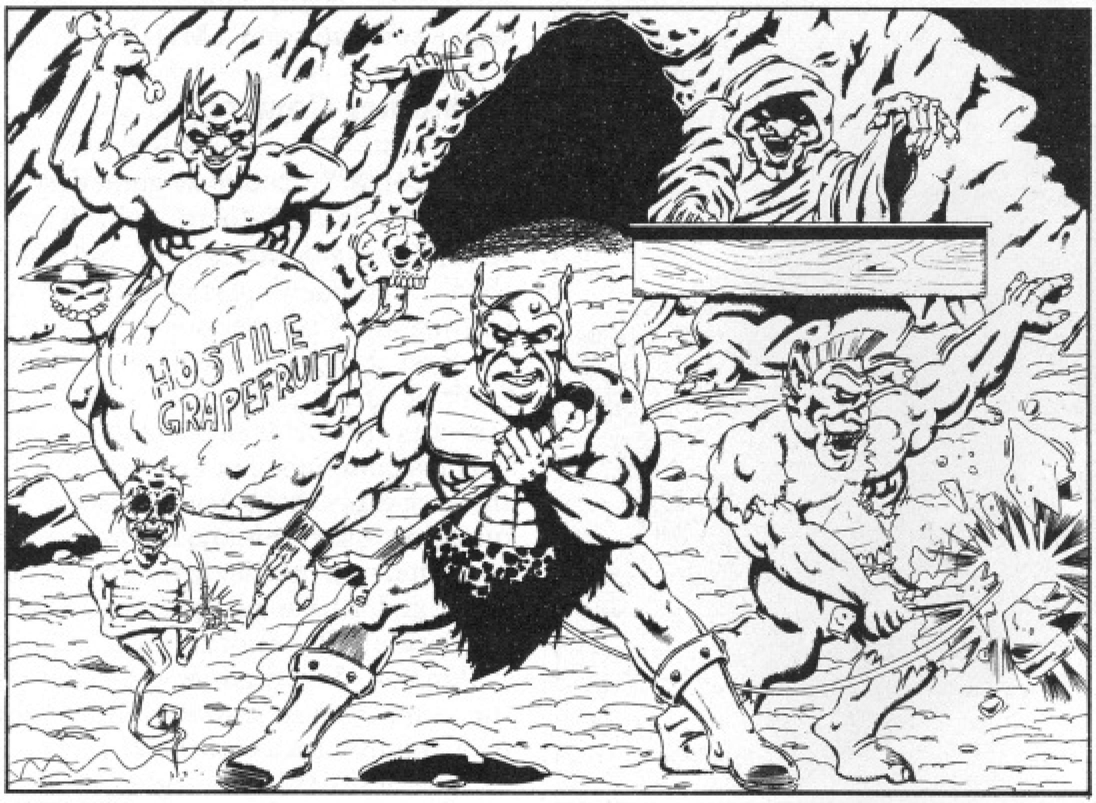
The term 'sequencing' is a little misleading these days as it stems back from the days when 8K was state of the art and sequencers could only remember a few notes and repeat them. Nowadays the term "MIDI Recorder" is more apt as whole songs can be entered and played back in much the same way as you would record and play a tape machine.

However Sequencers score over tape in that you can edit individual notes in or out and because the sounds aren't actually recorded (just their MIDI representations), mucho tweaking can be done once a song is recording.

Released at the British Music Fair was the Casio DH-100 digital horn which looks like a toy saxaphone but is in fact a MIDI controller that has the same fingering as that of a recorder, making it ideal for kids. In addition to the MIDI control you also have access to six preset sounds (sax, flute, trumpet, oboe, clarinet and synth-reed). At £99 r.r.p. you can't go wrong really.

However multi-keyboard specialists Farfisa have come up with a unit called Midimic which, put simply is a microphone with MIDI out as opposed to audio out. So if you can hum or whistle electronic sound source via MIDI. Furthermore Midimic has a line input on it which will allow you to hook it up to an acoustic instrument. All this for just £199.

*For contact names and addresses refer to 'Beyond the Sequencer' pp. 51*




# Become a




# MIDI Rock Star

*Your chance to win a Casio DG-20 electronic guitar*

To celebrate this special music issue we've teamed up with Casio and are giving one lucky reader the chance to own their very own DG-20 electronic guitar.

The DG-20 electronic guitar gives you all the flexibility of an electronic keyboard but uses strings instead of piano keys, just like a normal guitar.

Not only does the guitar offer numerous different sounds and special effects, it even has a built in drum machine.

Plus, for computer music freaks, there's even a MIDI interface so you could plug the DG-20 into your computer.

### How to Enter

Study the two cartoons on this page; there are a number of differences between them. Once you have decided how many differences there are, complete the entry coupon and send it to the editorial address (see coupon). Write the number of differences that you have found on the back of the envelope. If you don't your entry will not be accepted.

### The Rules

Entries will not be accepted from employees of Argus Specialist Publications and Casio. This restriction also applies to employees' families and agents of the companies.

The How to Enter section forms part of the rules. The Editor's decision is final and no correspondence will be entered into.

**Casio DG-20 Entry Coupon**

Name ...............................................

Address ...............................................

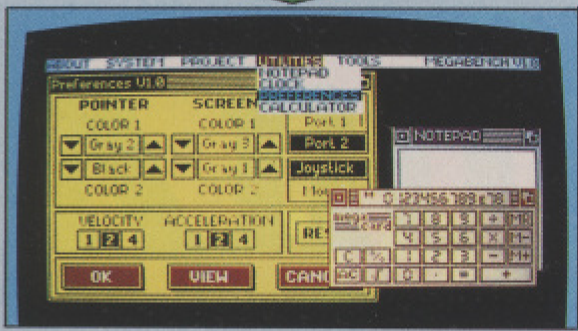
........................ Postcode ....................

Number of differences found ..............................

Closing date: 30th Sept 1988

Post to: Your Commodore
DG-20 Competition
ASP Ltd
1 Golden Square,
London W1R 3AB

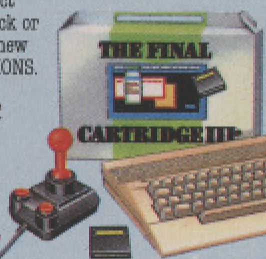
# KEEP IT SIMPLE!



## THE FINAL CARTRIDGE III

**A POWERFUL 64K ROM BASED OPERATING SYSTEM FOR THE C64 AND C128**

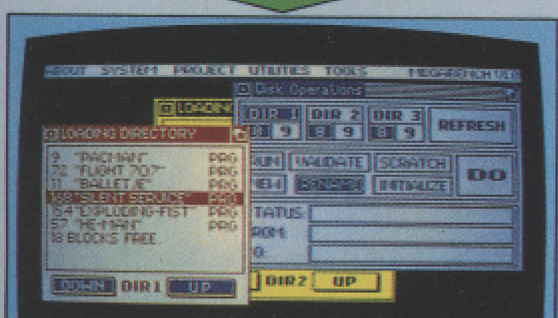
Easy to use WINDOWS and PULL DOWN MENUS allow you to select with either mouse, joystick or keyboard more than 60 new COMMANDS and FUNCTIONS. Various PRINTER-INTERFACES, a BASIC TOOL-KIT.




Comfortable ML MONITOR including 1541 drive access and sprite-editing, a NOTEPAD/WORDPROCESSOR with proportional characters, 2 DISK LOADERS with speeds, up to 15 times faster and a state of the art FREEZER. Transform your Commodore into a complete new - AMIGA LOOK ALIKE - system.




# WINDOWS



## THE FINAL CARTRIDGE III

The high-resolution bit mapped windows are selected from a menu bar. An unlimited number of windows can be open on the screen at the time. The windows can be freely moved on the screen.

The following windows are already implemented in ROM:

**PREFERENCE WINDOW**
Selects: mouse port, joystick port, mouse speed, screen colours, pointer colours, keyboard click, keyboard repeat.

**CALCULATOR**
Complete simulation of a LCD-calculator. Input either with mouse, joystick or keyboard. The numeric key-pad of the C128 can be used in C64-mode.



**NOTE PAD**
Easy to use wordprocessor with proportional characters enables you to store and print small notes, letters, etc.

**DIRECTORY WINDOWS**
Enables you to open directories from different disks and drives, sort and print directories.

**DISK WINDOWS**
Load, Run, Rename, Validate, Scratch, Initialize, Fast format disks.

**TAPE WINDOW**
Activates fast and normal modes.

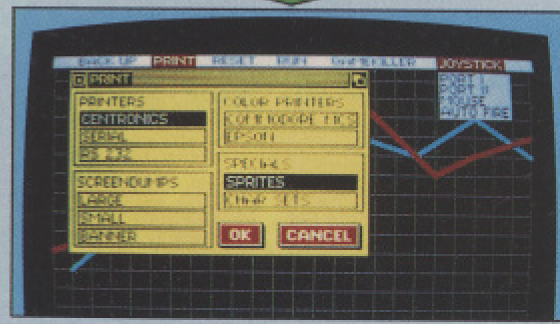
**PRINTER WINDOWS**
Select different printers, such as Commodore serial, Centronics, RS 232, Colour printers.

**REQUESTER WINDOWS**

**DISC BASED USER WINDOWS**

**CLOCK**
Real Time Clock, with Alarm.

# FREEZER MENU



## THE FINAL CARTRIDGE III

**Innovative hardware, combined with smart software, allow you to freeze and continue every well-known C64-program.**

**Freezer options include:**

**CENTRONICS/SERIAL/RS 232 SCREENDUMPS**
● Full A4 printing ● Variable printsize ● Colour printing ● Sprite printing ● Reverse printing ● Colour changes.

**GAMEKILLER**
● Kills sprite to sprite ● and/or sprite to background collision ● Can be started at any point in your game.

**AUTO FIRE**
● Transforms a normal joystick to an advanced auto fire engine.

**JOYSTICK PORT CHANGER**
● Never blow up your computer again by changing joystick ports while the C64 is running.

**BACK UPS**
● Disk to disk ● Tape to disk ● Disk to tape ● Back up files are packed and reloadable without the Final Cartridge III ● 60K in 15 sec. (disk) ● Exits to Monitor or Basic.

**ML MONITOR**
Comfortable ML monitor.
Does not reside in memory.
Functions include:
● Scrolling up and down ● 64K ROM/RAM access ● Sprite editor ● Character editor ● Drive monitor ● Fast loading and saving ● Printer driver.

# PULL DOWN MENU



## THE FINAL CARTRIDGE III

**Almost all commands and functions that are not activated by windows can be selected from a menu bar, which appears on top of the screen after pressing the fire button, either in Basic or from the freezer. The following Basic Toolkit and keyboard extra's are included:**

● Renumber ● Auto ● Delete ● Old ● Help ● Kill ● Find ● Replace ● 24K extra RAM for Basic ● Append ● DAppend ● DSave ● DOS ● Moniter ● Drive monitor ● Sprite editing ● Centronics interface ● Fast format ● Low Res screen-dumps ● Plist ● Scrolling up and down ● Stops and continues listings ● Programmed functionkeys ● Packer/Cruncher ● Hex to decimal conversion ● Pokes, syscalls and variables may all have Hexadecimal values ● Trace, Dump, Order, Mem.

**FINAL CARTRIDGE** is a super powerful Utility/Backup Cartridge to give your 64/128

**AMIGA LOOK-A-LIKE SCREENS** Plus backup power and unmatched Toolkit!

When reviewing **FINAL CARTRIDGE III, Comodore Computing International said,** "This product is so versatile, so easy to use, it deserves the highest commendation. If you want probably the best utility around check out **FINAL CARTRIDGE III**."

**ONLY £39.99 FREE POST**

ALL ORDERS NORMALLY DESPATCHED WITHIN 48 HRS

**HOW TO ORDER . . . .**

| BY PHONE | BY POST | FAX |
|---|---|---|
| 0782 744707 24 hr Credit Card Line | Send cheques/POs made payable to Datel Electronics | 0782 744292 UK ORDERS POST FREE EUROPE ADD £1 OVERSEAS ADD £3 |

**DATEL ELECTRONICS**

DATEL ELECTRONICS LTD., FENTON INDUSTRIAL ESTATE, GOVAN ROAD, FENTON, STOKE-ON-TRENT, ENGLAND.

SALES ONLY 0782 744707 | TECHNICAL ONLY 0782 744324

# Music Composer

*Let your musical creativity run riot with this offering for the C64*

***By J. Oshry***

Everyone knows that the Commodore 64 has an amazing sound chip. However, if you want to program music, it is very cumbersome to POKE all the correct values into correct registers. This program will come to your rescue! You can enter your music with the minimum of fuss with musical knowledge.

When you first run the program, there will be a slight delay while it initialises itself. You will then see a screen which has a keyboard on it, and the current note, octave, length and voice. On the right hand side of the screen are brief instructions on which keys to use. We'll go through each command, so that you can use the program effectively and easily.

## Producing

To obtain a note, you have to press a key from the first row of letters beneath the keyboard. The note which you will produce will be in the second row of letters. The note is then stored in the computer's memory.

## Changing The Length of Notes

To change the length of a note, you have to stress either the ',' key to decrease the length, or '.' to increase the length:

| | | |
|---|---|---|
| 128 | = | 1/16 note |
| 256 | = | 1/8 note |
| 512 | = | 1/4 note |
| 1024 | = | 1/2 note |
| 1536 | = | 1/2 +1/4 note |
| 2048 | = | whole note |



Obviously you can create other lengths if you wish.

## Changing the Octave and Voice

To change the octave, press the ':' key to decrease by one octave, and the ';' key to increase the octave. If you have finished entering a voice, then press the 'F1' key to get into command mode. Then use the CRSR down key to descend the reversed bar. When it is covering the command 'NEXT VOICE', press the RETURN key. You can then begin entering the next voice.

To save your music, you must enter command mode and go to the 'LOAD MUSIC' or 'SAVE MUSIC' options. You will then be prompted for a file-name, and if you are using tape or disk, the music will then be saved or loaded onto the appropriate device. (To enter a pause, press the SPACE bar – the length of the pause wil be the current length shown on the screen.)

## Changing the ADSR

To change the attack, decay, sustain or release, go to the appropriate option in the 2ND MODE. Once you have pressed RETURN when the reversed bar is covering the appropriate option, you will be asked initially what voice you would like to change. You will then be prompted to enter the attack, decay, sustain or release. After that, you will go back to the main screen.

## Changing the Tempo

You can not only play your musical piece at one speed. If you would like a slower or faster tempo, enter the 2ND MODE. You will then be given a list of the different speeds that you can have. Press the appropriate key to obtain the appropriate tempo.

To delete a note, just enter command MODE, and press RETURN. The last note entered will then be deleted.

## Frequency Display

If you want to display the frequencies of the notes already entered, go into 2ND MODE, and press RETURN. You will then be asked if you will be using screen or printer for output. The frequencies will then be displayed with the length of the note.

*To find out all you need to*

# Know

*about the Amiga computer*

# it

*pays to subscribe to 'Your Amiga'*

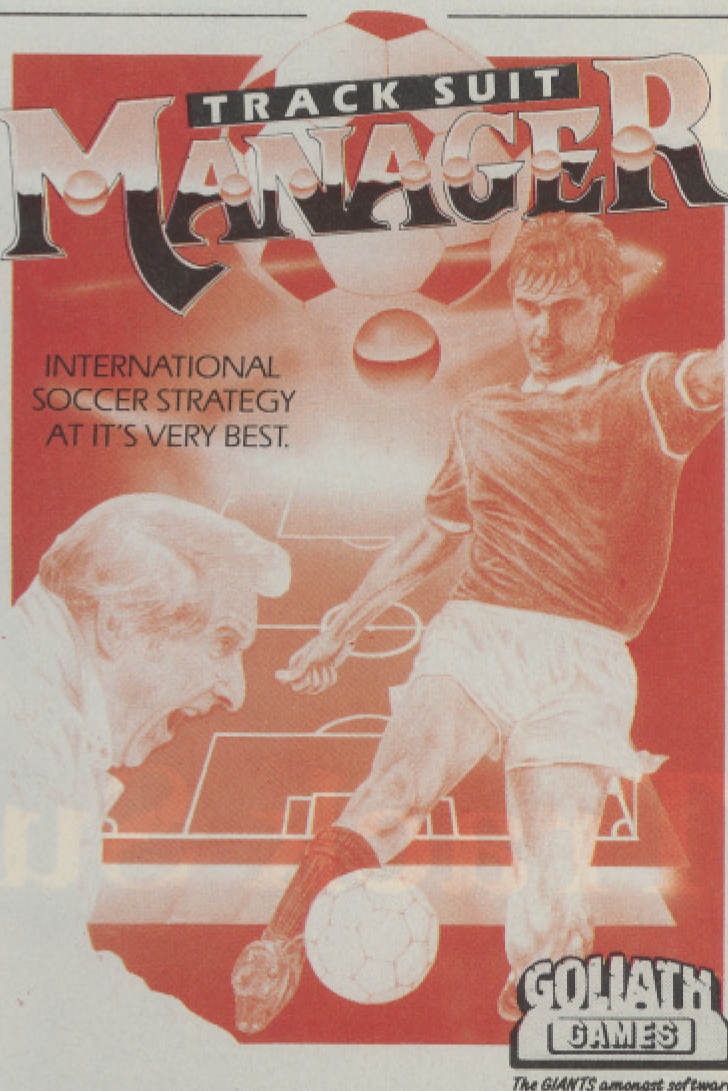
# all

*you need to do is fill in the coupon*

U.K. £9.00, Europe £11.80, Middle East £11.90,
Far East £13.00, Rest of the World £12.10
Airmail rates on request.

Please commmence my subscription to YOUR AMIGA with the .......................... issue. I enclose my cheque/money order for £............... made payable to ARGUS SPECIALIST PUBLICATIONS LTD.
or debit £................. from my Access/Barclaycard
No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
Valid from .............. to ..............
Signature ..................................................
Name ..................................................
Address ..................................................
.................................. Postcode ..........................

*Send this form with your remittance to:*
INFONET LTD. 5 River Park Estate,
Billet Lane, Berkhamsted, Herts HP4 1HL




From the Designer of 'The Double' comes . . .

## TRACK SUIT MANAGER

The first ever football game with real match tactics.

**FIVE MINUTES REMAINING** and the score is 1-1. You must win against Italy to qualify for the NATIONS CUP FINALS when Robson intercepts a long pass and slowly moves forward – Altobelli challenges but Robson rides the tackle and sends a long through ball to Barnes ... "Offside" shouts Caprini. "Play on" signals the ref. Lineker races towards the near post, Hateley moves back for the high cross ... Barnes Shoots ...

## YES AT LAST THE BIG ONE

A management game with so much more.

★ 54 Computer managed Countries ★ 54 Squads of Computer controlled Players ★ Build your own 'squad' from 100 Individually talented Players ★ Select own Country ★ World Cup & Nations Cup ★ Qualifying group matches (all countries) and the Finals ★ Monthly Diary ★ Most advanced Scout reports **EVER** ★ Friendlies & Tours ★ Climatization ★ Visit other Internationals ★ Real Newspaper Headlines ★ Public Opinions ★

## AND THERE'S MORE . . .

**Sophisticated Match Play with** ... Adjustable Team Formations ★ Free Kicks ★ Throw In's ★ Offside's ★ Individual Player Abilities ★ Goal Kicks ★ Corners ★ Penalties ★ Tackles ★ Fouls ★ Select Player for 'Set Pieces' ★ Injuries ★ Booking's ★ Sending Off's ★ Suspensions ★ Substitutes ★ Heading ★ Genuine Penalty Shoot Out in Quarter, Semi & Final Matches ★ Extra Time ★

## AND MORE . . .

**Individual Player & Team (Defence, Midfield, Attack) tactics** ... Defensive ★ Attacking ★ Normal ★ Quick Counter Attacks ★ Zonal Marking ★ Man to Man Marking ★ Offside Trap ★ Sweeper System ★ Possession Football ★ Long ball Passing ★ One-Two Short Passing ★ Aggressive Tackling ★ Take Corners, Free Kicks etc ★ Stay back ★ Play Upfield ★ Avoid Heavy Tackles ★ AND MORE! ★

**GOLIATH GAMES is a 'NEW' Software House specialising in ... ADVANCED ... INVOLVED ... ORIGINAL SOFTWARE.**

**ORDER NOW ... £9.95** Including V.A.T. Plus 50p post & packing

GOLIATH GAMES
*The GIANTS amongst software*

PLEASE SEND CHEQUES/P.O. TO:-
46 LOCKING ROAD
WESTON-SUPER-MARE
AVON BS23 3DN
0934 22538

**COMMODORE 64, SPECTRUM**

If you're disappointed by England's dismal performance in the recent European Championships and think that you could do better as the man in charge then start practising those cliches as you load in Goliath's Track Suit Manager.

As the game begins the headlines in the Daily Scrag and Sporting Knife greet your arrival with enthusiasm but if you don't start producing the goods they'll be on your back. The task ahead is far from easy with the first qualifying match for the European Championships just a few months away. If you survive, the World Cup follows shortly after.

Once the game has loaded the C64 draws the teams for the European Championship qualifiers that are thankfully split over the years giving you some time to play a few friendlies, scout on the opposition and try out the mass of goalkeepers, defenders, midfielders and forwards at your disposal.




# Track Suit Manager

To help you choose your squad you can read a report on each player which rates a variety of abilities from tackling to shooting, heading to passing and confidence and fitness. Goalkeepers are evaluated on their reactions, handling, how well they deal with crosses and the accuracy of their kicks.

Unfortunately, you can only select a player if his club will release him so be prepared to lose Lineker or Shilton at the last minute and be ready with appropriate back up players to fill in where required. Once you've selected a 22 man squad it's time to try them out in either a friendly or perhaps a tour. Either can easily be arranged and for a real test you could take on Argentina, Brazil, Columbia and Uruguay on a South American tour.

Before each game you must obviously select the team that will play but also how they will play. Will they play attacking football, possession football, a sweeper system, offside trap 4-4-2 or 4-3-3 formation, short or long passing and zone or man-to-man marking. You can then scout the opposition to find out how they play and who are the danger men. Then to give you almost absolute control you can give each individual player instructions about whether to stay up or back and decide who should take corners and penalties. You can even decide who they mark. For example, if you're playing Argentina you may decide it's worth keeping Robson back to help out with the defence and telling him and Butcher to mark Maradonna.

Once the match begins a small diagram of the pitch shows the general position of the ball and text descriptions describe the play. For example, Shilton kicks the ball out to McMahon, McMahon passes to Robson, back to Butcher, long pass forward to Beardsley, Beardsley shoots..., inches wide.

If you want to speed up the action you simply press the cursor keys. If you press them often enough you can end a half in under five seconds.

Halftime gives you the chance to adjust the tactics to either hold onto a lead or chase or go for goals, you can even put on two substitutions but you can do this at any time.

Although the result is important, especially to the newspaper headline writers, as Manager you must look at the game to see who's playing well and ask yourself, is the defence holding out, is the midfield helping put and then pushing forward to help the attack and are you scoring goals? Then when you've worked out what's wrong who are you going to change to put it right, bearing in mind an injury, sending off or a club not prepared to release a key player can spoil the best of plans.

When you reach the start of the qualifiers the pressure quickly builds up as you realise this game counts. Now you must decide whether you go with experience (a half fit Brian Robson) or try out a younger star (Gascoigne) who's shown a lot of promise. Luckily, there is at least a month's gap between matches, often longer so there might be time to put things right if you get off to a bad start.

The finals in June bring their own problems. You can take a squad of 22 players and that's all so if you start picking up injuries or bookings you could head for trouble just when you don't need it as you come across stronger sides. Whatever the outcome the World Cup qualifiers begin almost as soon as you return only this time with more groups and a bigger finals stage.

Track Suit Manager is one of the best football games I have played and certainly highlights the problems facing a national team manager. You have so many players to choose from, so few matches to get it right and then tough opposition to play and if you don't do well the press are waiting for you when you get back home. **T.H.**

***Touchline:***
***Title:*** *Track Suit Manager.* ***Supplier:*** *Goliath Games, 46 Locking Road, Weston-Super-Mare, Avon BS23 3DN.* ***Tel:*** *0934 22538.* ***Price:*** *£9.95 + 50p post & packing.*

# Constructing a



*In the last couple of installments we have looked at the basic operation of the compiler system and defined the FCL language – now it's down to the real work – the source editor program – EDIT.*

***By Steve Carrie***

EDIT is a small BASIC machine code loader program which slihtly alters the operation of the C64's resident line editor. Normally, a line of text is scanned after the return key has been pressed to see if it contains any valid BASIC keywords. If any are found, they are replaced by a single byte token values which represent the particular keyword found. This is similar to the operation of our compiler's lexical analyser. The tokens will be recognised by the execution routines in the machine's BASIC interpreter and the required action carried out.

Because we do not want the interpreter to perform this action, we must replace the normal interpreter routine that inputs a line of text with our own. Fortunately, Commodore has provided us with an easy means of doing this by defining RAM-based vectors used by the interpreter. Don't worry too much about how this edit program works because it isn't really all that important here. Just type in the BASIC loader program (Program 1) and RUN it (save it first of course!).

The machine code will be placed into the cassette buffer, the vectors POKEed with new values, a sign-on message displayed and the BASIC loader NEWed. Whatever you do, don't try to edit a BASIC program with this installed as any new lines entered will not be tokenised by BASIC and any existing lines LISTed will produce strange results. Use EDIT only for preparing source code for the compiler!

## Structure of program lines

This description if equally valid for both EDITed program lines and normal BASIC lines. In order for the interpreter's editor to easily manipulate lines in memory, the designers of Commodore BASIC made use of special bytes called **line link bytes.** These link bytes contain the address of the next line's link bytes. Should these link bytes contain zero, then the end of the program has been

**Fig 1 structure of a BASIC/EDIT line in memory**

```
0   11   lh   nl   nh   (tokenised text)            0
    11   lh   nl   nh   (tokenised text)            0
    ..................
    0    0                       (end of the file)

11,lh    link address low/high
nl,nh    line number low/high
```

reached. The full structure of a typical program is shown in Fig. 1.

The first zero is not actually part of the program itself but is used by the interpreter to mark the start position of BASIC text in memory. The zero at the end of the line is the interpreter's end-of-line marker. As you can see, the link bytes point to the next line and the end of the file is marked by two zero link bytes. The COMPILE subroutine which reads in a line of source text makes use of the various bytes to correctly GET a program line.

## The COMPILE program

COMPILE is arguably the most important program of the system. It is the program which reads the language text written by the programmer and converts it into a set of pseudo code strings which are used by the code generator, CODEGEN to produce the program assembler source. COMPILE is approximately 1000 lines long and is as neat and tidy as Commodore V2 BASIC will allow (i.e. as few GOTOs as possible...).

There is a comprehensive error checking facility with in excess of twenty possible error conditions, all of which are listed later. COMPILE will scan the entire file, reporting any errors if and when it finds them. The program operates on a maximum of four disk files at any one time. It has been designed to be extend able to a certain extent though, to be honest, it's not all that easy! It operates in approximately 23K of memory leaving some 15K for its variables. The various sections of the program are detailed below;

**Main control section** the segment from line 10 to line 380 controls the operation of the compiler. From here, the system initialisation phase is called (line 10) and all subsequent phases eventually return to here. Lines 100 to 190 comprise the main loop which reads in the data and processes it line by line. Lines 230 to 360 report any problems during compilation and line 370 calls up the code generator only when no errors have been reported.

**Initialisation phase** the subroutines "error messages"; 450 to 910, "initialise"; 980 to 1160, "define functions"; 1230 to 1360, "read in keyword table"; 1430 to 1720 and "get filenames"; 1790 to 1870 comprise the

**Fig. 2 — reserved words and symbols with token values**

| Array Element | Token | Symbol | Array Element | Token | Symbol |
|---|---|---|---|---|---|
| **STATEMENTS** | | | | | |
| 00 | 128 | end | 01 | 129var | |
| 02 | 130 | int | 03 | 131 | string |
| 04 | 132 | array | 05 | 133 | bset |
| 06 | 134 | wset | 07 | 135 | loop |
| 08 | 136 | endloop | 09 | 137 | while |
| 10 | 138 | when | 11 | 139 | if |
| 12 | 140 | endif | 13 | 141 | else |
| 14 | 142 | charout | 15 | 143 | fopen |
| 16 | 144 | begin | 17 | 145 | fclose |
| 18 | 146 | for | 19 | 147 | input |
| 20 | 148 | output | 21 | 149 | write |
| 22 | 150 | read | 23 | 151 | subroutine |
| 24 | 152 | return | 25 | 153 | call |
| 26 | 154 | external | 27 | 155 | forward |
| 28 | 156 | cls | 29 | 157 | wait |
| 30 | 158 | halt | 31 | 159 | syscall |
| **OPERATORS** | | | | | |
| 32 | 160 | or | 33 | 161 | xor |
| 34 | 162 | and | 35 | 163 | not |
| 36 | 164 | = | 37 | 165 | <> |
| 38 | 166 | <= | 39 | 167 | >= |
| 40 | 168 | < | 41 | 169 | > |
| 42 | 170 | + | 43 | 171 | - |
| 44 | 172 | * | 45 | 173 | / |
| 46 | 1774 | ++ | 47 | 175 | -- |
| **FUNCTIONS** | | | | | |
| 48 | 176 | byte | 49 | 177 | word |
| 50 | 178 | len | 51 | 179 | char |
| 52 | 180 | str | 53 | 181 | asci |
| 54 | 182 | stop | 55 | 183 | key |
| 56 | 184 | charin | 57 | 185 | left |
| 58 | 186 | right | 59 | 187 | mid |
| 60 | 188 | sysfn | 61 | 189 | iostat |
| 62 | 190 | dstat | 63 | 191 | derr |

As the line is processed, a sequence of pseudocode is written to the string OC$ for later disk output. The legality (syntax) and meaning (semantics) are thus checked by this large series of subroutines.

initialisation phase. The keyword table contains the list of reserved language elements. Most of functions defined in "define functions" are used mainly during lexical analysis to check character types. The subroutine "initialise" is the main one which makes calls to all of the others after setting up arrays, etc.

**File I/O** a number of subroutines provide the disk file I/0 facilities. These are "open disk files"; 1940 to 2010, "write data files"; 2080 to 2340, "read line from disk file"; 2410 to 2490 and "write to file"; 2560 to 2570. The "open disk files" routine is called at the beginning of compilation to open the work files. The "read" and "write to file" routines are used to input data from the source file and write data to the pseudocode file respectively while "write data files" is called after compilation to write the symbol and literal data files.

**Lexical Analysis** the first major phase in compilation is performed by "split line" and "tokenise line". The first of these breaks the line up into segments in the array L$(), the original source text being held in IL$. Next, the line is scanned by the "tokenise" routine to replace any occurances of reserved language symbols or words by single byte tokens. This process is controlled from the subroutine "perform lexical analysis" at lines 2750 to 2770 which is itself called from "do lexical/syntax/semantic" at lines 2640 to 2670.

**Syntax/Semantic Analysis** this process is also controlled from the routine at 2640 and takes up the rest of the program. The subroutine "perform syntax/semantic analysis" at lines 3270 to 3300 controls this phase. Depending on the contents of the array L$(), control will be passed to either "handle symbol-type expression" at lines 3590 to 3890 or to "routing of keywords" at 3370 to 3520 where control may be passed to any one of a number of subroutines beginning at 5660 to 8960. These subroutines check the syntax of the appropriate command found. The "symbol-type" branch assumes that the line contains some kind of assignment expression.

Whatever branch is taken, the routine at 4200 to 4760 "expression analysis" and its subordinate routines "function dispatch"; 4830 to 4910 with function handlers beginning at 9040, "literal string handler"; 4980 to 5020, "numeric & symbol evaluation"; 5090 to 5270, "place opcode"; 5340 to 5370, "evaluate numeric string"; 5440 to 5580 and "find symbol"; 3960 to 4130 will eventually be called.

These routines work together to correctly sequence any calculations made in an expression and in some cases, evaluate literal numbers. The "expression analysis" subroutine is capable of handling very complex expressions with functions and/or parenthesis. One of the main tasks carried out by this routine is to ensure that calculations are carried out in the correct order. The precedence of an operation or function is determined by its position in the keyword table.

The higher the position, the higher the precedence; thus * has a higher precedence than + whereas OR has a lower precedence than AND. Fig. 2 shows the contents of the keyword table and the values of the tokens used to represent each keyword. Type checking is also carried out to ensure that no illegal operations or assignments are carried out such as adding a number and a string.

## The Pseudo Code

Much has been said about the pseudo code generated by this program. Fig 3 lists the pseudo opcodes and their meanings.

**Fig. 3 table of Pseudo Codes.**

| Code | Operand bytes | Function |
|---|---|---|
| 1 | 2 | Load AC2 with the value given by the operand bytes. |
| 2 | 0 | Push the contents of AC2 to the stack. |
| 3 | 0 | Retrieve the contents of AC1 from the stack. |
| 4 | 2 | Save AC2 to the address given by the operand bytes. |
| 5 | 2 | Load AC2 from the address given by the operand bytes. |
| 6 | 2 | Increment the value at the address given by the operand bytes. |
| 7 | 2 | Decrement the value at the address given by the operand bytes. |
| 8 | 0 | Move the contents of AC2 to UP1. |
| 9 | 0 | Move the contents of AC2 to UP2. |
| 10 | 2 | Load SD2 with the literal string at the address given by the operand bytes. |
| 11 | 2 | Save SD2 to the address in the op. bytes. |
| 12 | 2 | Load SD2 from the address in the operand bytes. |
| 13 | – | unused |
| 14 | 0 | Move SD2 to the stack. |
| 15 | 0 | Recover SD1 from the stack. |
| 16 | 0 | String operation prefix. Indicates that the next operation is to be treated as a string operation. |
| 17 | 0 | Select channel in AC22 for input. |
| 18 | 0 | Select channel in AC2 for output. |
| 19 | 0 | Write value in AC2 to output. |
| 20 | 0 | Write the string pointed to by SD2 to output. |
| 21 | 0 | Write to a Carriage return to output. |
| 22 | 0 | Write a TAB to output. |
| 23 | 0 | Load AC2 from array. Array address is in APT (array pointer). |
| 24 | 0 | Save AC2 to array. |
| 25 | 0 | Load SD2 from array. |
| 26 | 0 | Save SD2 to array. |
| 27 | 0 | Recover the value from the top of the stack and place in array pointer. |
| 28 | 0 | Increment array element. |
| 29 | 0 | Decrement array element. |
| 30 | 0 | Move AC2 to array pointer. |
| 31 | 0 | Read a numeric literal from input into AC2. |
| 32 | 0 | Read a string literal from input into SD2. |
| 33 | 0 | Clear I/O channels. |
| 128-191 | 0 | Tokens for keywords in Fig. 1. |

## Extending COMPILE

There are several stages to adding new commands to the compiler. First, you must add the keyword into the correct section of the keyword table initialisation routine; statements operators or functions. I will warn you now that while it is relatively easy to add new statements and functions, adding operators is not recommended. Once the keyword is in place you must add the necessary service subroutine and its corresponding line number into the appropriate dispatch routine; "routing of keywords" for statements or "function dispatch" for functions. In some cases, certain existing service subroutines may be able to cope with your new keywords. Notice how several functions use a common subroutine (e.g. **byte** and **word**).

## The FCL compiler: User's Manual

The program should be LOADed and RUN. Lowercase mode is selected and the sign-on banner displayed. Alter a few moments, you will be asked for the name of the file to be processed. This file should have the default extension FCL. Thus, if you have created a file FILE.FCL you need only enter FILE when asked for the filename. **COMPILE** is a one-pass language processor and displays any error messages in reverse video characters under the lines in which they occur. A list of error and warning messages is given in Fig 4, "**COMPILE** Error messages".

Upon completion of a successful compilation the code generator **CODEGEN** is automatically loaded and RUN. Refer to the **CODEGEN** User's manual for information regarding this program.

## Speed of compilation

**COMPILE** is written in commodore BASIC V2 as thus it may take some time to process your programs. The average speed of compilation is approximately 25 seconds per screen line. This figure is probably not a very accurate one since the semantic analyser may take some time to process lines which contain complicated expressions and very short lines may compile quickly.

That's all for this "episode". Next time I'll present the CODEGEN and ASSEMBLE programs. In the meantime, you may want to try compiling some of your programs as well as the two example files in the FCL Programmers Manual (presented last time). If you do, it might be a good idea to either remove or REM out line 370 in COMPILE to prevent an attempted load of CODEGEN.

### Fig 4 COMPILE Error messages

**Symbol not defined** – indicates that a symbol was referenced but never declared in the Data Division.
**Symbol re-defined** – a symbol was declared and then re-declared later in the program.
**Incorrect use of type descriptor** – type descriptors **int, string** and **array** may only be used in conjunction with **var**. This is printed if they are used used in any other way.
**Missing expression** – an expression was expected but was not found.
**Parenthesis Error** – there are an unequal number of opening and closing parenthesis in the expression being scanned. May also indicate operator problems.
**Incorrect use of operators** – possibly two operator are together in an expression; e.g. 3*+4 is not legal.
**Syntax Error** – A general syntax message indicating a mispelling or incorrect command layout.
**Numeric Overflow** – a numeric literal is larger than is allowed.
**Garbage at end of line** – the compiler could not make sense of this line at all.
**Missing symbol** – a symbol was expected but was not found.
**Illegal symbol** – a reserved word or illegal name was used for a symbol.
**Function/operator syntax error** – an error has occurred within an expression. This is a more explicit message than "syntax error" and points to a problem in the layout of a string or numeric expression.
**Missing variable descriptor** – a variable type descriptor was expected in a **var** statement but was not found.
**Missing operator** – an operator was expected in an expression but was not found.
**Type mismatch error** – you cannot directly assign a quantity of one type to another type.
**Incorrect use or reserved word** – You have used a function or statement in the wrong context
**Control Structure error** – the compilerwill not allow you to mix up controlstructure types. Nested controlstructures are allowed but you cannotoverlap them.
**Procedure Division Error** – noprocedure Division was found.
**Statement outside procedure division** – self-explanatory.
**Control Structure not matched at END** – either an **if/endif** or **loop/endloop** control structure is still "open" at the **end** of the procedure.
**I/O file mode not defined** – no **input**or **output** mode was defined in an **fopen**statement.
**Subroutine Not defined** – a subroutine was referenced but had not been defined. May indicate a subroutinewhich requires **forward** definition.
**Subroutine already defined** – you have re-declared a subroutine.
**Subroutine structure error** – bad structure in a subroutine, possibly missing **begin** or **end** statement.
**No subroutine error** – a subroutine was defined by **forward** but not explicitly defined.
**Illegal use of subroutine name** – you have tried to use a subroutine name as a variable.
**Bad Subroutine name** – illegal characters in subroutine name.
**Subroutine inside procedure** – you cannot define a subroutine inside another procedure.
**Identifier too long** – twenty characters is the maximum length of any identifier, subroutine or variable.

#### Warning Messages

**Garbage at end of line** – line compiled ok but rubbish was found at the end of the line.
**Declaration inside procedure** – variable was defined inside a procedure but was still created.
**5ubroutine definitions inside procedure** – a **forward** definition was found inside a procedure.

As nuclear missiles hurtled across the skies to wipe out the super powers a group of US army engineers were building bridges across ravines in the Nevada desert. As the mushrooms started sprouting they took cover by evicting the inmates from a new top security prison.

As the fallout settled and the radioactive levels began to drop in the months that followed the engineers joined forces with survivalist groups to repel the attempts of the thugs, vandals and other criminals that tried to recapture what they claim was "rightfully theirs". As time went by they formed into the desert rangers and became the nearest thing to law and order left in the area. Your job is to take a party of desert rangers into the unknown to investigate a series of disturbances.

Each member of your party has the usual range of role playing characteristics including strength, dexterity, intelligence and charisma as well as individual skills that give the character a better chance of using a specific weapon well, climbing or swimming, disarming a bomb or picking a lock or any of the other skills that might just see you through this adventure alive.

# Wasteland




Although Wasteland was developed by the same team that brought you the Bard's Tales there is a notable addition in the guise of Tunnels and Trolls and Monsters Monsters author Ken St. Andre. This combination has created an exceptional game that features the top down wilderness view of SSI fantasy games and the Ultima series and the close up monster graphics as seen in the Bard's Tale. However, players expecting a Bard's Tale type game are in for some big surprises.

The Wasteland contains no easy pickings for characters looking to build up experience as even the weakest wimp can seriously damage your party if he's holding a LAW rocket or sub-machine gun. In the Wasteland it's your firepower that counts.

As your party steps outside the safety of the Ranger Centre (the new name for the prison) your four characters are armed with pistols and a limited number of ammo clips. One of your first priorities must be to find a few carbines, rifles and grenades. However, that's not all you'll find as the towns and cities are now controlled by the crooks you turfed out and if you survive the most continuous attack by snipers and gunmen you may find out where the bosses hideout is and in one town where they're holding the Mayor.

You'll find help in the weirdest places as you mix with the low life that has somehow survived the holocaust. Bartenders are, as always, a useful source of information and the occasional room key but this all costs money which means you're going to have to mug a few muggers to keep your finances in the black. You'll also find some characters that are willing to join your party that become Npc's or non-playing characters.

Although a Npc may add some much needed firepower to your party they also have their drawbacks as you have only partial control over their actions and they may even turn on you if they don't want to attack the enemy. They may also hog the experience gained for mowing down thugs, gunmen, bandits and punks because in Wasteland only the character that actually deals the killing blow gets any experience.

Should you manage to survive long enough to acquire some experience you can radio back to base for a field promotion which may bring you two more hit or constitution points and two points to add to any of your other characteristics. If you choose intelligence then you may be able to learn some skills and grow on confidence to enter one of the larger towns that are still patrolled by wardroids, visit the guardians, mount a commando style raid to free the Major of Needles, gamble in Las Vegas, do strange things with a four legged mutant or encounter one of the strange cults that have grown such as the mushroom people and the dangerous followers of the bloodstaff.

I have now spent the best part of a fortnight in the Wasteland and have a full party of seven adventurers since machine gun firing Christina, Mayor Pedro and the Covenant joined the group. My group are progressing through the ranks and can now handle most opposition since we raided an old arms store, once we'd disarmed the booby traps, and are about to set off into the desert again.

Wasteland is without doubt one of the biggest and best roleplaying games you can cram into your C64. It is packed onto two, double sided, disks and comes complete with an instruction manual and a book of 162 fighting fantasy style paragraphs that deal with the more interesting encounters.

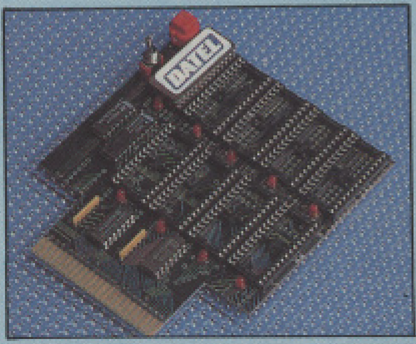
**T.H.**

***Touchline:***
***Title:*** *Wasteland.* ***Supplier:*** *Electronic Arts, Langley Business Centre, 11-49 Station Road, Langley, Nr. Slough, Berks., SL3 7YN.* ***Tel:*** *0753 49442.* ***Machine:*** *C64.* ***Price:*** *£16.95.*

# DATEL ELECTRONICS

## 256K SUPEROM EXPANDER

- Now you can select from any of 8 32K EPROMs instantly.
- 8 sockets to accept upto 32K EPROM in each.
- On board operating system — no programs to load.
- Program your own EPROMs using our EPROM programmer.
- No need to have loads of cartridges — just make a selection from the Superom menu.
- Directory of utilities on power up.
- Fully menu driven on power up.
- Select any slot under software controls.
- Unique EPROM generator feature will take your own programs — basic or m/c and turn them into autostart EPROMs. (EPROM burner required).
- Accepts 2764/27128/27256 EPROMs.
- On board unstoppable reset.



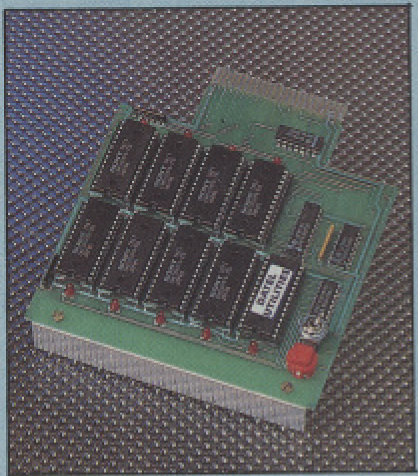
**ONLY £29.99**



## RESET CARTRIDGE

- Unstoppable reset button.
- Resets even so called "unstoppable" programs.
- Add pokes from magazines etc.
- Fits in cartridge port.
- Simply plug in.

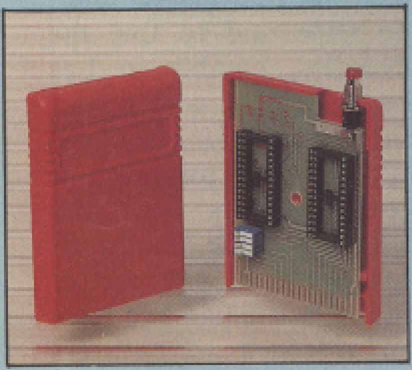
**ONLY £5.99**



## DUPLIKATOR™

- Copies whole disk in one pass – only one drive required!
- Makes back-up copies in eight seconds!!
- Duplikator is the fastest, most efficient and easiest to use disk copying system ever conceived.
- Comes complete with 256K on-board ram and it's own operating system – no software to load.
- Makes multiple copies from one original.
- Full disk verification during back-up process.
- Copies standard software as well as errors 21-29 and upto 40 tracks.
- Full disk error check in eight seconds.
- Full disk verify against ram in fifteen seconds.
- A must for clubs, user groups etc. How else can you copy over 250 disks and hour for less than £100.
- Comes complete with on/off switch and reset button.
- Fitted in minutes – no soldering usually required.

**ONLY £89.99**



## 16K EPROM BOARD

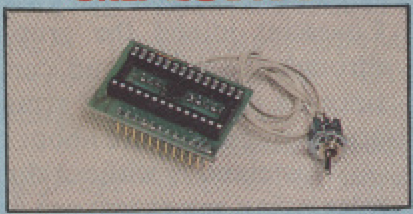
- Accepts 2 x 8K EPROMs.
- Switchable to configure as 2 x 8K or 16K or off.
- On board unstoppable reset.
- Full instructions.

**ONLY £8.99**

## DISK NOTCHER

- Quickly and easily double your disk capacity.
- Use both sides of your disks.
- Simple to use.
- Takes seconds.

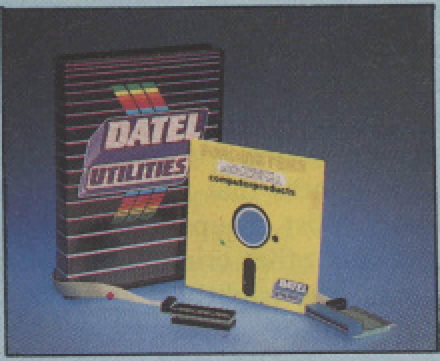
**ONLY £4.99**



## 4 WAY KERNAL BOARD

- This board fits in place of the kernal in your 64 and accepts a 16K or 32K replacement kernal giving 2 or 4 different operating systems.
- Just flick the switch supplied to select between systems.
- This is a carrier only – ready to accept your own chip.
- Now you can have all your different systems available at one time.
- Full instructions.
- Fitted in minutes.
- 5-Way Board

**ONLY £12.99**




## DEEP SCAN BURST NIBBLER™

- The most powerful disk nibbler available anywhere, at any price!
- Burst Nibbler is actually a two part system – a software package **and** a parallel cable to connect the 1541/1570/1571 to 64/128 (state type).
- What gives Burst Nibbler its power? Conventional nibblers have to decode the data from the disk before it can transfer it using the serial bus – when non standard data is encountered they are beat. Burst Nibbler transfers data as raw GCR code via the parallel cable without the need to decode it so you get a perfect copy of the original.

- Will nibble upto 41 tracks.
- Copy a whole disk in under 2 minutes.
- Full instructions.
- Regular updates – we always ship the latest.
- Fitted in minutes – no soldering usually required.
- Full or ½ tracks.
- No need to buy parallel cable if you have Disk Demon/Dolphin etc.
- Cable has throughbus extension for other add ons.

- Whether to choose FastHack'em or Burst Nibbler? Fast Hack'Em is unbeatable value as an "all-rounder" – with nibblers, 1 or 2 drive copy, format, file copy, 1571 copy etc. etc., so if you have a more general requirement perhaps FastHack'Em is for you. Burst Nibbler is a pure nibbler second to none, for the reasons stated. So if it's just making backups you are interested in, there is no other product to beat it.

**ONLY £24.99 COMPLETE**
**SOFTWARE ONLY £12.99 CABLE ONLY £14.99**

## BURST NIBBLER PARAMETERS DISK

- Burst Nibbler is the most powerful disk copier available – but there are still a few programs with very complicated protected, which makes it impossible to nibble copy. The Burst Nibbler Parameters Disk contains routines to copy individual programs.
- Used in conjunction with Burst Nibbler even the latest highly protected programs can be backed up.
- The disk contains over 100 parameters including many of the latest titles. Many of the titles can already be straight nibbled by burst nibbler – but can be used with the "Super Serial Nibbler" program (supplied) by users with drives that will not support parallel copier cables such as Excelerator, Oceanic etc.
- Simple to use – just nibble the disk then run the individual parameter for that program and the special routine will produce a perfect working copy – in some cases it will even de-protect it!
- Comes complete with "Super Serial Nibbler" program for users who can't fit a parallel copier such as Burst Nibbler to their drive (Excelerator, Oceanic etc)., not as fast as Burst Nibbler but when used in conjunction with parameters its formidable.
- Remember – this disk is by no means a must for Burst Nibbler owners since it already copes with over 90% of Software. But for those who want everything this is it. Also for none Burst Nibbler owners you get a "Super Serial Nibbler" which together with the parameters is a powerful utility.

**COMPLETE PROGRAM DISK # 1 AVAILABLE NOW ONLY £12.99**

## TOOLKIT IV

### The ultimate disk toolkit for the 1540/1541

- A disk toolkit is an absolute must for the serious disk hacker. Toolkit IV has more features than most for less.
- DISK DOCTOR V2 – Read and write any track and sector including extra and renumbered tracks. Repair damaged sectors. Look underneath read errors.
- HEADER/GAP EDITOR – Decodes and displays ALL header information including off bytes and header gap. Rewrite the entire header and header gap. Renumber sectors. Also edit any sector tail gap.
- DISK LOOK – Sort directory. Recover lost files. Display file start/end addresses. Disassemble any file program directly from the disk to SCREEN or PRINTER including undocumented opcodes. Edit Bam. Much, much more.
- FILE COMPACTOR – Can compact machine programs by up to 50%. Saves disk space. Compacted programs run as normal.
- FAST DISK COPY – Copy an entire disk in 2 minutes or less using single 1541.
- FAST FILE COPY – Selective file copy. Works at up to 6 times normal speed.
- FORMATTER – 10 second format an entire disk or format any individual track or half track 0 to 41. Redefine any of 30 parameters to create or recreate unique disk formats.
- ERROR EDIT – Quickly find and recreate all read errors including extra and renumbered tracks or sectors and half tracks from 0 to 41. Even recreates data under errors and allows you to redefine any necessary parameters.

**ONLY £9.99**

ER™

connect the

the disk
y are beat.
de it so you

s.
lly required.

an
you have a
second to
other

.99

grams
ler Parameter

the disk then
for that
ne will produce
some cases it

r Serial
ho can't fit a
Nibbler to their
.), not as fast
d in
ts formidable!
ly copes with
bbler owners

2.99

act machine
space.
al.
tire disk in

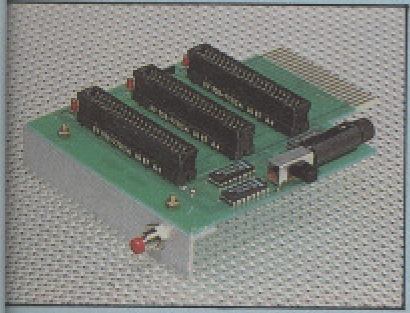
e copy. Works

nat an entire
or half track
ters to create

nd recreate all
numbered
rom 0 to 41.
and allows you
ers.

9

# DATEL ELECTRONICS



## 3 SLOT MOTHERBOARD

**Save wear and tear on your Expansion Port**

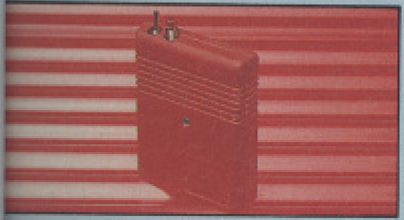
- Accepts 3 cartridges.
- Onboard safety fuse.
- Switch in/out any slot.
- High grade PCB.
- Fully buffered.
- Reset button.

**ONLY £16.99**

## DATA RECORDER

- Quality Commodore compatible data recorder.
- Pause control.
- Suitable for 64/128.
- Counter.
- Send now for quick delivery.

**ONLY £24.99**



## SMART CART™

**Now you can have an 8K or 32K cartridge that you program like RAM then acts like ROM!**

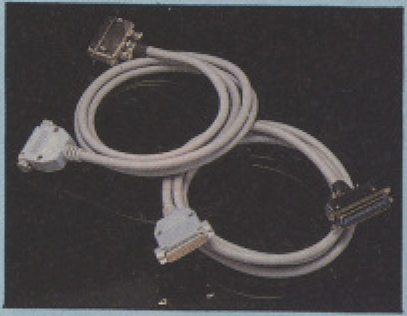
- 8K or 32K pseudo ROM.
- Battery backed to last up to 5 years (lithium battery).
- Simply load the program you require – then flick the switch. The cartridge can then be removed just like a ROM cartridge.
- Make your own cartridges including autostart types – without an EPROM burner.
- Can be switched on or off board via software.
- I/O 2 slot open for special programming techniques.
- 32K version has 4 x 8K pages.
- Some knowledge of M/C is helpful – but full instruction are provided.

**8K VERSION £14.99**
**32K VERSION £29.99**

## RAM DISK

- Turn your Smart Cart into a 32K RAM/disk.
- 32K of instant storage area for files/programs.
- Load/save instantly.
- Disk type commands: load, save, directory, scratch.
- Program data retained when computer is switched off!
- Full command set with instructions.

**ONLY £9.99**



## CENTRONICS PRINTER LEAD

- Connect your C64/128 to a full size Centronics Parallel Printer.
- Suitable for use with Action Replay IV or Final Cartridge III
- Also works with any Software/Graphics package that has parallel driver software built-in – this includes many popular wordprocessors, databases, etc.
- Top quality connections – ribbon cable 1.5m long.

**ONLY £12.99**

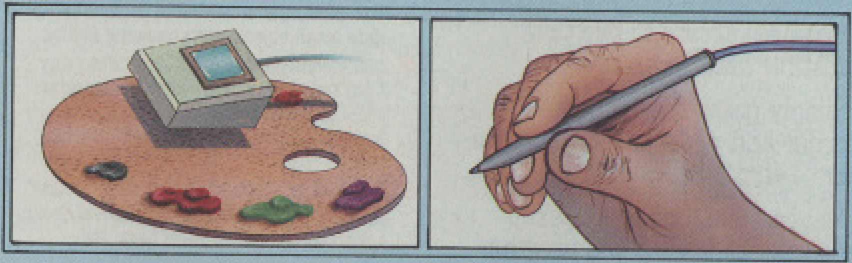


## TURBO ROM II

**Turbo Rom II is a replacement for the actual kernal inside your 64. It provides superfast load/save routines.**

- Loads most programs at 5-6 times normal speed.
- Saves at 5-6 times normal.
- Improved DOS support including 10 sec format.
- Programmed function keys:- load, directory, old, etc.
- Return to normal kernal at flick of a switch.
- FCOPY – 250 block file copier.
- FLOAD – special I/O loader.
- Plus lots more.
- Fitted in minutes – no soldering usually required. (On some 64's the old ROM may have to be desoldered).

**ONLY £14.99**



## BLAZING PADDLES

**A complete lightpen/graphics illustrator package.**

- A fully icon/menu driven graphics package of a calibre which should cost much more.
- Complete with a fibre optical lightpen system for pin point accuracy.
- Multi feature software including:
  - Range of brushes • Airbrush • Rectangle • Circle • Rubberbanding • Lines • Freehand • Zoom mode • Printer dump • Load/save • Advanced colour mixing – over 200 hues!!
  - Cut and paste allows shapes/windows/pictures to be saved to/from tape/disk.
- Blazing Paddles will also work with many other input devices including; Joysticks, Mice, Graphics Tablets, Trackball etc.
- Pictures can be saved from Action Replay and edited with Blazing Paddles.

Complete Blazing Paddles & Lightpen **ONLY £24.99**

Blazing Paddles available separately for **£12.99**

## GRAPHICS SUPPORT UTILITIES DISKS

**• A range of utilities to make the most of your high res pictures created with popular graphics utilities or captured with Action Replays unique picture grabber.**

### • SLIDE SHOW

- View your favourite screens in a slide show type display.
- Move from screen to screen – keyboard or joystick control.
- Very easy to use.

### • BLOW UP™

- A unique utility to allow you to take any part of your picture and 'blow it up' to full screen size.
- Even fills the border with powerful sprite handling techniques.
- Very easy to use – simple commands
- An interesting utility.

### • SPRITE EDITOR

- A complete sprite editor helps you create or edit sprites.
- Full colour display
- Animate to view movements.
- Action Replay can capture/insert sprites with any program – this editor is a perfect companion.

### • MESSAGE MAKER

- Takes your favourite screen – created with a graphics package or captured with action replay and turns it into a scrolling screen message complete with music.
- Send screens to your friends with music and text scrolling.
- Simple text editor – easy to use.
- Choice of music.
- An exciting utility.
- Finished screens stand alone.

**Complete disk with all four utilities**

**ONLY £12.99**

## ROBOTEK 64 — Model & Robot Control made easy

- Robotek 64 is a comprehensive hardware/software package which enables you to connect your 64/128 to the outside world.
- 4 output channels – each with onboard relay
- 4 input channels – each fully buffered TTL level sensing.
- Analogue input with full 8 bit conversion.
- Voice input for voice control.
- Software features:- test mode/analogue measurement/voice activate/digital readout etc.
- Excellent value! **ONLY £39.99**

including hardware/software/mic etc. (State tape or disk)



## DIGITAL SOUND SAMPLER

- The new sampler allows you to record any sound digitally into memory and then replay it with astounding effects.
- Playback forwards/backwards with echo/reverb/ring modulation etc.
- Now with full sound editing module to produce outstanding effects.
- Full 8 bit D to A and ADC conversion.
- MIDI compatible with suitable interface. (I.e. Datel unit for £29.99, see ad).
- Live effects menu includes real time display of waveforms.
- Line in/mic in/line out/feedback controls.
- Powerful sequencer with editing features.
- Load/save sample.
- Up to 8 samples in memory at one time.
- Tape or disk (please state).
- Complete software/hardware package **£49.99**
- Com-Drum software is available separately at **£9.99** to turn your Sampler II into a Com-Drum system as well as a sampling system.



## COM-DRUM

**Digital Drum System**

- Now you can turn your computer into a digital drum system.
- Hardware/software package.
- 8 digital drum sounds in memory at one time.
- Complete with 3 drum kits.
- Real drum sounds – not synthesised.
- Create superb drum rhythms with real and step time.
- Full editing.
- Menu driven.
- Output to hi-fi or through tv speaker.
- Load/save facilities.

**ONLY £29.99** (state tape or disk)

## COM-DRUM EDITOR

- 24 drum sounds supplied on disk to enable you to construct your own drum kit.
- Re-arrange sounds supplied with a Com-Drum to make new kits.
- With sound sampler hardware you can record your own kits.
- Load/save facilities.

**ONLY £4.99** disk only



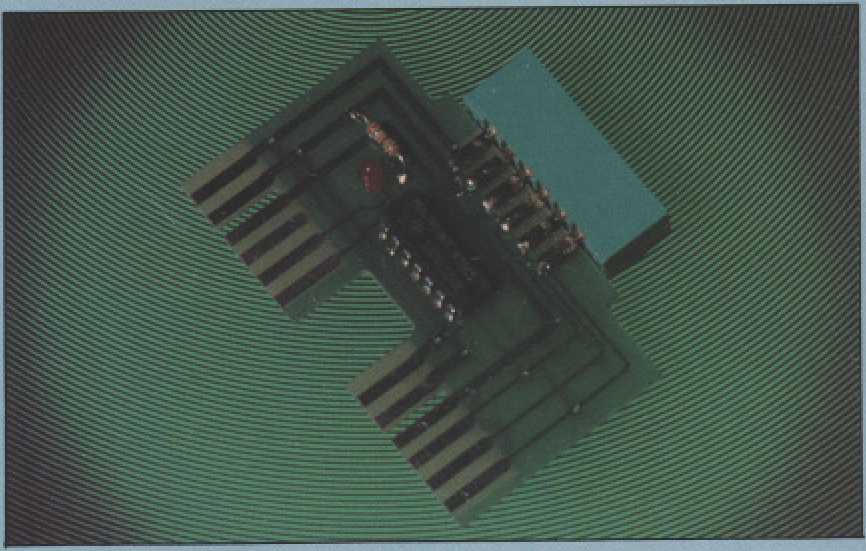
## MIDI 64

**A Full Midi Interface for the 64/128 at a realistic price**

- MIDI in.
- MIDI thru.
- 2 x MIDI out.
- Compatible with most leading software packages including: Seil, JMS, Advanced Music System, Joreth, Steinburg etc.

**ONLY £29.99**

# DATEL ELECTRONICS



## NEW CLONEMASTER™

**The most effective tape to tape back-up board available.**

- Makes perfect backups of your tapes easily and effectively!!
- No user knowledge at all needed.
- On board TTL logic circuitry actually shapes the program and sends a perfect signal to the record cassette — producing a copy better than the original in many cases.
- L.E.D. indicator shows when data is being transferred to avoid excessive tape winding.
- Works with almost any program including multi-loaders, turbos and even very unusual type turbos.
- Requires access to two CBM compatible data recorders
- Simply press 'Play' on one recorder and press 'Record' on the other — that's it!
- You can even make a backup while you are loading the program.
- This is a total hardware solution — no programs to load — the results are stunning!

**ONLY £9.99**

- **Datasettes are available for £24.99 (see other pages)**



## ROBOTARM
### — 5 Axis Movement
### — Full Function

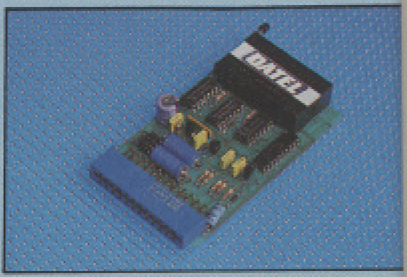
- Explore the fascinating science of Robotics with this full feature Robot Arm.
- Human like dexterity — with 5 Axis of movement it is so versatile. It can manipulate small objects with amazing ability.
- Easily controlled using 2 Joysticks (any 9 pin type) or connect to your computer with our Interface + Software to give Computer/Robotic control (see Interface offer).
- Comes with Accessories including 'Finger' Jaws, Magnetic Attachment, Shovel Scoop, 4 Stabilizing Suction Base Legs, etc.
- Uses 4 HP2 batteries (not supplied) to power motor movement so uses no computer power.
- Self contained, ready to use (except batts, joysticks).

**ONLY £49.99**

## INTERFACE OFFER

- Unique Software/Hardware package to allow you to interface your computer with the Robotarm.
- Train mode allows you to store and then repeat movement sequences.
- Very easy to use.
- This Interface is not needed to use the Robotarm but interfacing with your computer has great possibilities

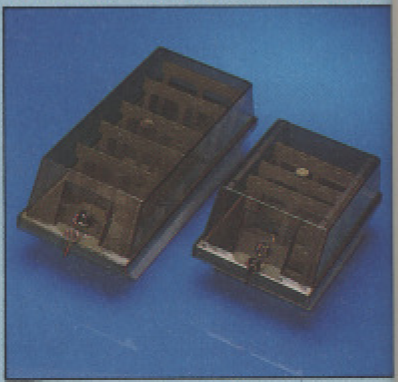
**ONLY £24.99**
**COMPLETE WITH CABLES.**



## EPROMMER 64™

- A top quality, easy-to-use EPROM programmer for the 64/128.
- Fully menu driven software/hardware package make programming/reading/verifying/ copying EPROMs simplicity itself.
- Will program 2716, 2764, 27128 and 27256 chips. 12.5, 21 or 25 volts.
- Fits into user port for maximum compatibility with cartridges/Superom Board etc.
- Full feature system — all functions covered including device check/verify.
- We believe Eprommer 64 is the most comprehensive, most friendly and best value for money programmer available for the 64/128.
- Ideal companion for Superom Board, Cartridge Development System, our kernal expanders or indeed any EPROM base project.
- Comes complete with instrutions — plus the cartridge handbook.

**ONLY £39.99 COMPLETE**

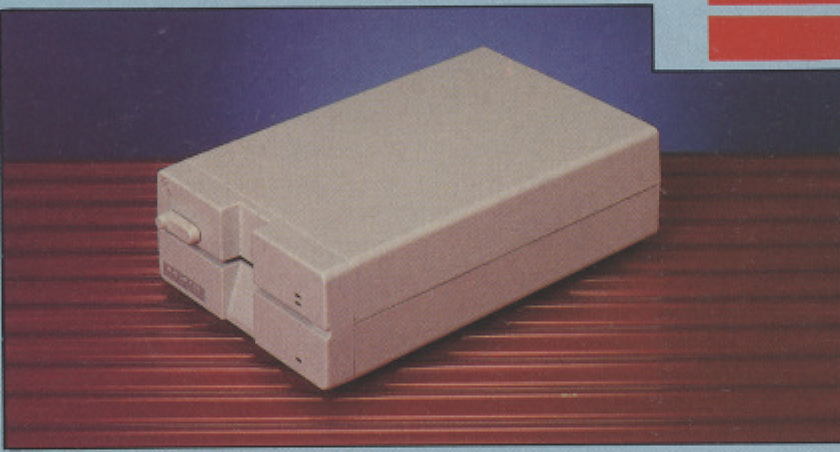


## DISKS/STORAGE BOXES (Lockable)

**For 5¼"**
- DD 50 hours upto 50 — **ONLY £6.99**
- DD100 holds up to 100 — **ONLY £8.99**

**For 3½"**
- DD 40 holds upto 40 — **ONLY £7.99**
- DD 80 holds upto 80 — **ONLY £9.99**

**Diskettes**
- 5¼" — DS/DD — **ONLY £24.00** for
- 3½" — DS/DD — **ONLY £49.00** for



## BLUE CHIP DRIVE
- **Fully C64/128 compatible.**

- At last a top quality drive at a sensible price.
- Super slimline case
- External power supply for cool operation.
- Direct drive motor.
- Supplied complete with all cables — no more to buy.
- This drive is now probably the most compatible drive available for the Commodore. More so than even Commodores own '1541C. Much more so than other so called compatibles. In fact we have been unable to find a program including the latest that would not work. (At time of Press).
- **No need to look elsewhere — this is the best.**

**ONLY £139.99 POST FREE**
**(If you require courier delivery add £5.00).**

## ULTRA CRUNCHER

- **The ultimate cartridge based program compactor.**

- Compacts by upto 30%!
- More programs for disk.
- 3 compacting programs on one cartridge.
- Fast loading/saving routines — works with Disc Demon.
- Can even further compact AR III files!
- 250 block file copy function.
- Full DOS support including fast format.

**ONLY £12.99 on cartridge.**
**Available as chip only for 256K Superom Board for only £7.99**

## FAST HACK'EM ™

- **Multi Module Disk Nibbler — all on one disk.**

- Single 1541 Nibbler — Copy a disk in 2 minutes.
- Auto Nibbler — Copy an entire protected disk in 3 minutes.
- Super fast File Copy — Under 9 seconds typically.
- Copes with Fat Tracks.
- Superfast Copy — Entire disk in 36 seconds with verify.
- Twin Drive Copier — Even faster!
- Plus unique "Parameters" mode. These files "Unlock" the more heavily protected programs with a parameter for a particular brand or even single program.
- **No other product is such a good "All Rounder" at this price its unbeatable.**

**ONLY £9.99 POST FREE**

**ALL ORDERS NORMALLY DESPATCHED WITHIN 48 HRS**

## HOW TO ORDER . . . .

| BY PHONE | BY POST | FAX |
|---|---|---|
| 0782 744707<br>24 hr Credit Card Line | Send cheques/POs made payable to 'Datel Electronics' | 0782 744292<br>UK ORDERS POST FREE — EUROPE ADD £1 OVERSEAS ADD £3 |

# DATEL ELECTRONICS

**DATEL ELECTRONICS LTD., FENTON INDUSTRIAL ESTATE, GOVAN ROAD, FENTON, STOKE-ON-TRENT, ENGLAND.**

| SALES ONLY | TECHNICAL ONLY |
|---|---|
| 0782 744707 | 0782 744324 |


M

M
sound
espec
conce
comm
menti
Th
in ha
produ
use in
or ma
locati
The a
create
future
Th
differe
A
given
the sc

FX

Fig
Fu
Fu
Fu
Fu
Fu
Fu
Fu
Fu
Ke
Ke
Le
Re
Q
CR

Fig

00

FX

[00
[00

# Musical FX

*Creating just the right ZAP, POW or WHEE for your latest game was never easier than with this superb FX editor*

*By K.A. Lynch and M.W. Else*

Many people are very efficient programmers until it comes to producing any form of sound from their computer. This is especially true where the C64 is concerned as it does not have any commands to deal with the afore mentioned.

This is where *FX EDITOR* comes in handy, as it will allow you to produce up to sixteen different fx's for use in your own programs, either basic or machine, and will reside at any location in memory that is required. The actual editor will allow you to create and bank up to 102 fx's for future reference.

There are 15 values that effect each different fx.

A brief explanation will now be given for each value and its effect on the sound you create.

**PITCH1**: This actually consists of two values (lo and hi bytes respectively) that control the overall pitch of the current fx being played or edited.

**PITCH 2**: this is also two values. These are treated as single values and control the pitch of the second and third wave forms respectively.

**WAVE**: This value is used to select the waveform that forms the base of the 4 current fx. There are only certain values that will work and these are:

[11] - TRIANGLE WAVEFORM
[21] - SAWTOOTH WAVEFORM
[41] - PULSE WAVEFORM
[81] - WHITE NOISE WAVEFORM

Please note, these values can be merged to create different fx e.g. [21] + [41] = [61]. The second nibble changes the effect! range 0 - f.

**ADSR**: These values give the Attack, Decay, Sustain and Release values for the current fx. These range from 00 - ff. Each nibble in both bytes is treated as a single number from 0 - f.
23 f5 A=2 D=3 S=f R=5.

**PI**: This is an extension to PITCH1 that allows you to enter a greater value for the pitch of the sound.

**SP**: This is two separate values, each performing a different task. The first nibble determines which, if any, of the three waveforms are to be used or merged. Values to be used are as follows:

[4] Combines wave 2 with the main waveform
[8] Combines wave 1 with the main waveform
[c] Combines all three waveforms

If the main veform is to be used on its own then use value [4] and put a 0 in the [S] section of PS.

The second value on SP is merely a speed counter and can range from 0 – f. 0 is the fastest speed and f the slowest.

**WAVE-S**: This is used to set up the two secondary waveforms that can be merged with the main waveform throughout the fx as it is played. Each byte uses the same values as given for main waveform. Each of the two waveforms mentioned are directly affected by SP and PS values.

**PS**: Two separate values again, the first nibble being a pulse value ranging from 0-8. Any values above 8 may effect sounds created after this value. The second number is the length of the secondary waveform that has been chosen.

**LENGTH**: This is a lo and hi byte format to determine the actual length of the FX currently being played or edited.

**RD**: This is a pulse control which will give you different pulse forms dependant upon the value (00 – ff).

## Using the FX-EDITOR

Once you have loaded the FX-EDITOR there are two different SYS addresses that can be used to gain access to the editor. These are:

### FX EDITOR main keys

**Figure 1** – different keys used within the editor

| Key | | Action |
|---|---|---|
| Function 1 | – | Copy FX to FX |
| Function 2 | – | Disk Directory |
| Function 3 | – | Copy FX to FX-BANK |
| Function 4 | – | Load FX data |
| Function 5 | – | Copy FX-BANK to FX |
| Function 6 | – | Save FX (Normal data) |
| Function 7 | – | Save Stand Alone FX-PLAYER |
| Function 8 | – | Save FX-BANK |
| Keys X / Z | – | Scroll up / Down FX-BANK |
| Keys + / - | – | Plus / Minus FX number |
| Left Arrow | – | Auto repeat key On / Off |
| Return | – | Enter / Play current FX data |
| Q Key | – | Quick Reference Card (KEYS) |
| CRSR Keys | – | Move Cursor Respectively |

**Figure 2 FX EDITOR screen display details.**

```
PITCH1      PITCH2       WAVE      ADSR        PI
------------------------------------------------------
00   00   00       00    00     00        00   00

  SP       WAVE-S        PS     LENGTH       RD
  00     00        00    00     00      00   00

FX NUMBER : 00              COPY NUMBER : 00
------------------------------------------------------
[00] ....................   [33] ....................
[00] ....................   [34] ....................
```

32768 ($8000) – Cold start editor.
and 32771 ($8003) – Warm start editor.

As you have just loaded the FX-EDITOR you will need to cold start the editor so use SYS 32768. You should now be faced with the main editor screen. If you press the Q key you will jump into the *QUICK REFERENCE CARD* which is just a little aid to help you remember the keys needed to create and store fx.

## Storing Effects

The bank facility is an added extra so that you can create a library of named FX, and then create a player to suite your game or program. Press F3 and the cursor will move to the bank section of the screen. Using Z and X to scroll up and down in the bank and CRSR LEFT / RIGHT to choose column one or two.

Once you have chosen the place to store your FX press RETURN and then type the FX-NAME. Press RETURN to enter it into the bank.

F5 key is the exact opposite of 3, when pressed you are prompted to enter a BANK number. When you have entered a number between [$00] and [$65] press RETURN to copy the FX from the BANK to the editor itself.

F1 key is similar to 5 but copies FX to FX using a number between [$00] and [$0f].

FUNCTION keys 4, 6 & 8 are self explanatory, just enter the filename required and press return. All three functions have an error check routine provided.

## Creating a Stand-Alone Player

This is the main objective of the actual *FX-EDITOR*. A player that will run independent of the editor and can be placed at any location in memory.

When you have designed all of the FX that you require for your game/program it is time to create the player.

To create the player you must have all of the FX needed stored in one of the 15 different easy access FX. When this is done press F7 key and you will be asked for a player address. This is the address at which you would like the player to reside and can range from [04] (SCREEN) to [fc] (KERNAL-ROM/RAM). For now we will use [c0] ($c000) so enter CO (RETURN) or use your own. The editor will now save your stand alone player. Use F2 to get a disk directory. Notice the editor takes up 4 BLOCKS on the disk, this will never change no matter how many fx you use!

## Using The Stand Alone Player

This is probably the hardest part of all as you require a small interrupt to run the player in real time.

For machine code users this should be no problem, you can use the program below or just put a JSR $--06 in your own program, -- is your player address in this case CO.

Basic users must set up an interrupt using data statements to place the machine code in memory, again you can create your own or use the one provided!!!

## Your First FX

First enter the data provided below and we will go through what each value does.

```
Line 1 - 00 06 44 06 45 0a 0b 60
Line 2 -   40 00 61 45 10 00 00
```

Press RETURN and you will see that the values you have just entered have given you a *lazer shot* effect, quite good eh! Now lets see how we can change it around.

First we will change the second value (hi byte) of PITCH1 to [16] and press RETURN. See how the effect changes dramatically from a low pitched lazer to a very high pitched lazer. We can also use the ADSR to adjust the volume and length of the FX: A=1 D=f [1f] / S=0 R=4 [04], note that the volume is higher and the FX is cut short.

If we change SP to [80] and change WAVE-S (lo byte) from 00 to 81 you will hear two different sounds being combined to create one FX. PS if changed (try [65]) will give you a variable pulse speed. Notice the higher pitch because the pulse is quicker. The S value of PS is the length of WAVE-S (hi-byte).

LENGTH if changed will give you a long or short fx, try using [40] [00] or [00] [10]. Finally try the RD value which in simple terms gives a set RanDOM pulse value [f9].

The best way to learn about the FX-EDITOR is not to read about it but to actually play with it and fiddle. We have included a few FX for you to look at and use in your own programs if you wish.

```
FX # 1 - 00 11 00 04 21 F9 99 41
           40 41 83 20 00 10 00
FX # 2 - FF FF FF F6 81 3A 19 55
           80 61 11 60 90 90 FF
FX # 3 - 00 2F 13 3F 13 0B 59 2B
           CF 81 00 10 03 00 00
```

**MACHINE-CODE INTERRUPT**

```
INTERRUPT SEI          ;Disable interrupts
          LDA < INT    ;Get lo byte of interrupt
          STA $0314    ;Store at interrupt pointer (LO)
          LDA > INT    ;Get hi byte of interrupt
          STA $0315    ;Store at interrupt pointer (HI)
          CLI          ;Re-enable to basic
INT       JSR $CO06    ;Call FX PLAYER
          JMP $EA31    ;Jump to main interrupt routine
```

**BASIC USER INTERRUPT** (Add to your program!)

```
10 FORT=0 TO 20:READ DT:POKE 896+T,DT:NEXT
20 SYS 832:PRINT "DONE":END
30 DATA 120,169,141,141,20,3,169,3,141
40 DATA 21,3,88,96,32,6,192,76,49,234
```

If you have no previous knowledge of machine code or hexadecimal, then use the set values [$CO] otherwise change the reversed numbers to the address you set the player.

# Software for Sale

*If you think that one of our programs looks very interesting, but you can't afford the time to type it in then our software service will help you out*

It's three o'clock in the morning. You sit at the computer keyboard having just finished a marathon typing session entering one of the superb programs from *Your Commodore*. Your fingers reach for the keyboard and press the letters R, U and N. You press RETURN, sit back and nothing happens.

Everyone has probably faced this problem. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

The *Your Commodore* Software Service makes available all of the programs from each issue on both cassette and disk at a price of £6.00 for disk and £4.00 for cassette. None of the documentation for the programs is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

INFONET LTD, 5 River Park Estate, Berkhamsted, Herts HP4 1HL.
Tel: (04427) 76661

Please contact this address for prices and availability.

## The Disk

Programs on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programs much easier. Unfortunately at the moment we cannot duplicate C16 and Plus/4 cassettes. However programs for these machines will be available on the disk.

What programs are available?

At the top of each article you will find a strap containing the article type, C64 Program etc. So that you can see which programs are available on which format, you will also find a couple of symbols after this strap. The symbols have the following meaning:

This symbol means that the program is available on cassette.

These programs are available on disk.

## Please Note

Since the programs supplied on cassette are total working versions of the program, we do not put disk-only programs on tape. There is no sense in placing a program that expects to be reading from disk on to tape.

**APRIL 1988**

**AUTO START MAKER** — Give your disk programs that professional look by making them auto-start (C64 Disk Only).
**CLEAR WITH BASIC** — A series of short Basic routines illustrating various ways of clearing your C64.
**TABULATE** — Format your numerical printouts with ease (C64).
**Commodore Modem Revealed** — A small basic program showing how you can write your own programs for your Commodore modem.
**MAKING GEOS BRITISH** — Have you ever wished that GEOS had a £ sign or that GEOdex had British addresses — modify your GEOS programs to do just that (C64 disk only).
**EXTENDED BACKGROUNDS** — Alter the background colour for every screen line — a still display all 256 characters (C64).
**GYROSPEED** — Transfer your single part programs from C64 tape or disk to turbotape.
ORDER CODE
DISK YDAPR88 £6.00
TAPE YCAPR88 £4.00

**MAY 1988**

**DESIGNER** — A powerful drawing package for C64 owners.
**80 COLUMN VIDEO** — A simple 80 column character designer for the C128 plus disk.
**CHARACTER GRABBER** — Grab your favourite C64 character sets and use them in your own programs.
**ADVENTURE KIT V** — The fifth part of our continuing library of C64 adventure writing routines.
**C128 FKEYS SWAPPER** — Store four sets of function key definitions with this handy utility.
**SCREENDRAW 64** — A powerful C64 character and background editor for producing your own scrolling backdrops (disk only).

ORDER CODE
DISK YDMAY88 £6.00
TAPE YCMAY88 £4.00

## JUNE '88

**DIRECTORY EDITOR** — A superb utility that allows you to alter your disk directories as well as add comments (C64 disk only).
**30K RAM DISK** — Turn unused memory on your C64 into a pseudo disk.
**BASIC LISTER** — List a Basic program stored on disk without having to load it into memory (disk only).
**EASY BASIC TOOLKIT** — Give your C64 over 30 new basics – including the ability to store libraries of subroutines.
**DISK SECTOR EDITOR** — Examine the contents of your Commodore 1541 disks (disk only).

**ORDER CODE**
**DISK YDJUN88 £6.00**
**TAPE YCJUN88 £4.00**

## JULY '88

**EASIPRINT** — Now C16 and Plus/4 owners can access their printer functions with a set of 60 easy to use Basic commands (available on disk only).
**HANDY INPUT ROUTINES** — Make your Basic programs idiot-proof and more attractive with these two Basic input routines (C64).
**MAKING MUSIC** — A simple C64 synthesiser to accompany our popular series.
**DIY PARALLEL INTERFACE** — Use this software and a lead of your own manufacture to drive a Centronics printer (C64).
**CP/M CENTRONICS INTERFACE** — Give your 128 in CP/M mode access to a Centronics printer..
**CASSETTE INLAY PRINTER** — Use your printer to produce neat inlays for your cassette collection (C64).
**DISKASSEMBLER** — Dissassemble your programs direct from disk with this program for the C64 (Disk Only).

**ORDER CODE**
**DISK YDJUL88 £6.00**
**TAPE YCJUL88 £4.00**

## AUGUST '88

**MAKING MUSIC** — Programs to accompany August's installment of our super music series (C64).
**SHORT INTERLUDE** — Overcome the problems of handling more than one interrupt with this handy routine for machine code programmers (64).
**TAPE ORGANISER** — A high speed program filing system for cassette users. (C64).
**SPILT BAUD RATE TERMINAL** — Drive an RS232 modem with this TTY software for C64 or C128.
**SPRITE LIBRARY** — Aeroplanes are the subject of this installment (C64).
**EDUCATING SYDNEY** — Create an image of the SID chip in memory so that you can see what it's up to whenever you require (C64).
**SIMPLE** — Give your Plus/4 the facility to use Icons and pull down menus. Available on disk only.

**ORDER CODE**
**DISK YDAUG88 £6.00**
**TAPE YCAUG88 £4.00**

Cassettes or disks are available from March 1986. Please ring the editorial office (01-437 0626) for details of these.

**ORDER FORM – PLEASE COMPLETE IN BLOCK CAPITALS**

| NAME | QTY | TAPE/DISK | ORDER CODE | PRICE |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| **SEPTEMBER 88** | | **TAPE (£4.00)** | **YCSEP88** | |
| **SEPTEMBER 88** | | **DISK (£6.00)** | **YDSEP88** | |
| OVERSEAS POST £1 | | | | |
| | | | TOTAL | |

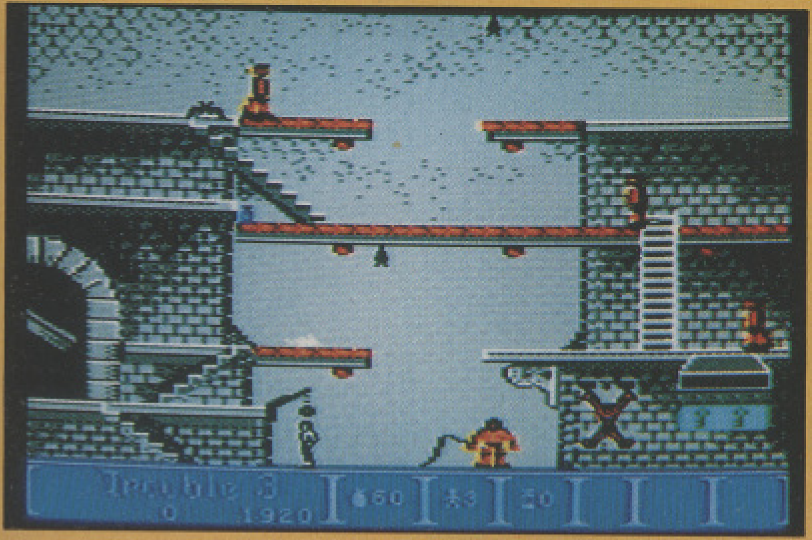
NAME. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

ADDRESS. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

POSTCODE. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**I enclose a cheque/postal order for £. . . . . . made payable to ARGUS SPECIALIST PUBLICATIONS LTD.**

All orders should be sent to: YOUR COMMODORE, READERS SERVICES, ARGUS SPECIALIST PUBLICATIONS, 9 HALL ROAD, HEMEL HEMPSTEAD, HERTS HP2 7BH.
Please allow 28 days for delivery.



# Dark Castle

All computer games tend to follow certain fashions. Somebody comes up with a new idea and within the next few months, there are a dozen clones on the market. Recent examples would include Gauntlet type games and vertically scrolling shoot em-ups. If we keep to the fashion analogy, then Dark Castle, the latest game from MirrorSoft is best likened to flared trousers! Something that you thought disappeared years and years ago but about which there is always the odd rumour of an impending comeback. (What is wrong with flares? I still have several pairs in my wardrobe-Ed) (Enough said – GRH).

Dark Castle is a platform game and perhaps some of our readers are too young to remember the heady delights of Manic Miner and the like but the basic theme is the same. The intrepid hero climbs ladders and ropes, leaping over gaps and all the time avoiding whatever nasties his quest happens to throw at him.

Your quest in this case is short and to the point. Enter the castle and kill the Black Knight. No explanation is given as to why this should be necessary. As in armies all over the world, you are not paid to think, only to blindly carry out orders. So it is that you cross the drawbridge into the castle. It creaks shut behind you cutting off your only line of retreat.

Finding yourself in the entrance hall, you are confronted by four doors. These lead to areas known as Fireball, Shield, Trouble and Black Knight. Select one and the game begins in earnest.

At the start of the game, you have only a bag full of rocks to defend yourself with. How quickly you learn how to master the art of throwing these determines how long you are likely to stay alive. You can adjust the angle at which you release the rocks from up above your head to somewhere just missing your toes. As various creatures start aiming themselves at you, a working knowledge of basic trigonometry could prove useful.

Bats start off attached to the ceiling and this offers your best chance of hitting them. Better a stationary target than a moving one. Vultures line up like squadrons of mediaeval space invaders. The floors are infested with rats. Bites from these, whilst not fatal, do require an elixir to rid you of such wonderful diseases as plague and rabies.

Apart from these minor inconveniences, it only remains to avoid the guards, mutants, henchmen, gargoyles, dragons and the like. Many of these are only stunned when you hit them and quickly regain their previous menace. This wonderful assortment of fauna doesn't poison you, it merely kills you. Fortunately, some kind person has left lots of bags of boulders casually lying around the dungeons, just waiting for you to pick them up. There is also a reasonably plentiful supply of elixirs.

Before you get to meet the big baddy, you will have to find a key that lets you into his domain. Gossip also has it that you stand precious little chance of winning the final encounter unless you also have the knowledge of fireballs and possess the shield. The wizard is the man to see about the secrets of fire. Once gained, every boulder that you casually toss around will become a ball of the hottest flames, burning to a crisp everything that gets in its way. The shield, when found, will render you temporarily invisible and so must be used sparingly.

The castle itself does not seem to hold many terrors. There is the odd trap door but most of the damage is done by its guardians. My favourite amongst these has surely got to be the whip henchman. Casually flogging some poor prisoner, he stops only when you creep up behind him and belabour him about the head with a handily placed mace.

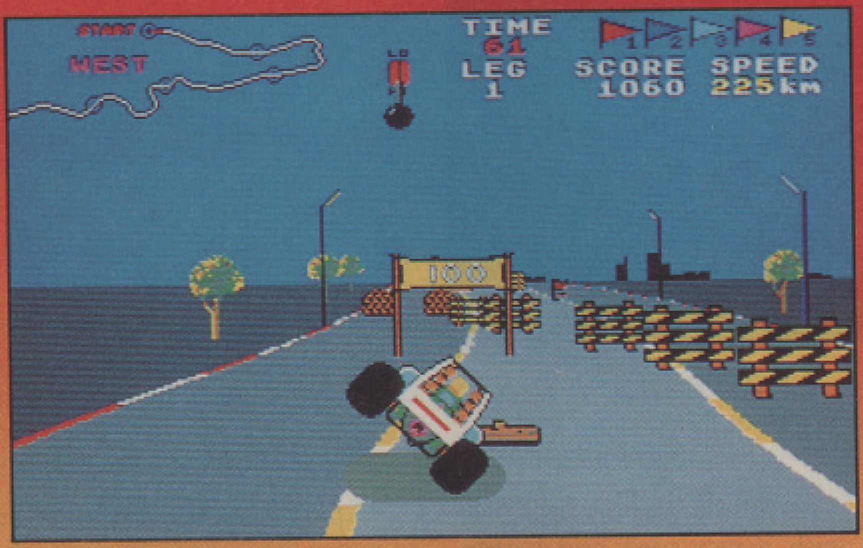
Graphically, I found the game very disappointing. The characters are small and jerkily animated. Colour is almost non-existent and the overwhelming impression is grey. The whole thing looks very dated. Sonically too, some of the effects and music are way off beam, especially a horrendous rendition of the opening of Bach's famous Toccata.

All this had the effect of putting me off the game. Gameplay itself is not too bad although a little fiddly but overall, Dark Castle failed to capture my imagination. And that is despite being a fan of platform games.

**G.R.H.**

***Touchline:***
***Title:*** Dark Castle. ***Supplier:*** *MirrorSoft, Athene House, 66-73 Shoe Lane, London EC4P 4AB* ***Tel:*** *01-377 4645.*
***Price:*** £8.99 (Ca) £12.99 (Disk).

# Buggy Boy




If games like Pole Position let you pretend that you are some great Formula One racing driver, it is difficult at first glance to see the attraction behind other car simulations. As is often the case though, first impressions can lead you astray. Buggy Boy, Elite's conversion of the Tatsumi arcade game, offers the one ingredient that seems to be missing from a lot of the present crop of computer games – it is great fun to play!

Certainly, your car is no Ferrari. The Baja Bug looks more like a jeep with four badly swollen tyres. But then how many Ferraris do you know that can hit a log at over two hundred kilometres per hour, bounce off it, fly through the air and land safely on the other side?

There are no other cars to compete against either. It is simply a case of you against the clock and the obstacles. The obstacles usually win.

There are five different tracks to test your skills on. The first one – off road – is simply a continuous loop. Complete one lap and you get to go over the same ground again and again. The other four, with the original names of north, south, east and west take you off into the sunset or towards the icy wastes depending on which direction you choose.

The object of each course is to reach the next staging post before your time runs out. Success gives you an extended play allowing you to aim for the next one and so on.

Control of the car is straightforward. All controlled via the joystick, it consists of a simple left, right, accelerate, brake and a choice of low or high gear. Most of the time is spent going flat out in top gear. The only time you really need to change down is after you have hit something. Driving is not the problem though. It is the obstacles.

Hitting a wall or tunnel or driving off a bridge into the water tends not to do your car very much good and you come to a complete standstill wasting valuable seconds. Colliding with boulders, gates, barrels and the like rolls the buggy head over heels. You slow right down but don't actually stop. One way, and indeed sometimes the only way to avoid a hazard is to deliberately drive into a log. This causes you to bounce and hopefully fly over a series of gates blocking the road or whatever. Another trick is to make use of any banked track that happens to be around. Hitting a mole hill or tree stump flips the buggy onto two wheels. It is perfectly safe to drive like this providing that you know how to get down again. It is all too easy to tip the car over by steering the wrong way.

Points are awarded according to how far down the road you get before your time runs out. There is however another major source of points and one that is more than likely to cause your downfall. Scattered all over the track are a series of coloured flags and gates. Hitting a flag or driving through a gate gives you the point value associated with it. These range from 30 to 500 points and the problem is that all the high scoring ones are cunningly placed near the obstacles so that should you try to aim for them, you considerably increase the risk of your having an accident. Hitting the coloured flags in the correct order gives you a few seconds to collect bonus points from the flags and gates and you can also collect extra time. Driving through a 'time' gate adds two seconds to your clock. This might not sound very much but it can make the difference between reaching the next stage or not. Again, you have to make sure that you don't hit anything or you end up losing more time than you gain. Occasionally bonus objects appear such as footballs that disappear satisfyingly into the distance when you hit them.

The game looks bright and colourful although the graphics are not in the top notch and some such as the explosion when you crash are downright disappointing. Sadly as well, Buggy Boy is bugged which is something of a bung**. If you manage to land on top of a boulder or on the edge of the river, the game simply hangs up. That apart though, Buggy Boy really does have that 'just one more go' feel to it and I thoroughly enjoyed playing it.

**G.R.H.**

***Touchline:***
***Title:** Buggy Boy. **Supplier:** Elite, Eastern Avenue, Lichfield, Staffs WS13 6RX. **Price:** £9.95 (Ca) £14.95 (Disk).*

# BARD'S TALE III




You know the old saying that "when the going gets tough, the Bard goes drinking". In the third biggest and best game in the Bard's Tale series the Bard will need a lot of drink since it's going to get very tough.

Now Skara Brae is in ruins, the equipment shop, Roscoe's emporium and most of the taverns are little more than a pile of rubble. The Mad God Tarjan has been at work.

Soon you discover that Skara Brae was not the evil one's only target and he now must be stopped. What you now face makes your encounter with the evil Wizard Mangar seem like a fond memory. Armies of Paladins and Archmages have fallen but now great heroes once again form into a small party this time to do battle with the Mad God himself. In your party should be a thief as the thief could be the only way to complete your hazardous quest that leads from a starter dungeon to battles across seven dimensions and a final conflict with Tarjan himself.

However, those battles are many weeks away as your meagre level one and two characters that begin the game have enough trouble staying alive against vipers and bandits and must put ideas of grappling with gods out of their mind until they've at least conquered the starter dungeon.

Bard's Tale fans will of course know that in these a starter dungeon means you have to be over level 10 to stand a chance of taking out Brilhasti ap Tarj whose a nasty piece of work and one of Tarjan's minions. So inevitably your first session consist of quick forays into the Tarj's lair to grab some experience points, treasure and maybe even some weapons since there's nowhere in the town left to buy them.

Luckily, the review board still stands but is now only manned by an old man but he can still review your chances for advancement. Class changing, provides a source of information and procides over changes in class.

Bard's Tale III has not only 500 monsters, over 100 spells, seven dimensions and 84 dungeon levels to explore, it also has two new classes of magic user.

The Chronomancer takes a lot of developing as he must have learnt all seven levels of spells in three classes then he becomes the magical equivalent of a taxi to take you to the other dimensions. They lose all the spells they learnt to become a Chronomancer but gains access to some particularly effective spells that can send and retrieve people from the grave, cure old age and at the highest level cause up to 1500 points worth of damage with a Fatal Fist spell.

Many Bard's Talers feel that fighters have a raw deal as they keep the magic users alive long enough to gain in power but then they fall behind. In Bard's Tale III a fighter can also wield magic by becoming a Geomancer.

The fighter can be changed from anything from a Bard to a Hunter, Rogue or Monk and must find the single location in the game where he can change. If he does this he loses all his previous special abilities, such as a Bard will loose his songs, a Hunter his critical hit ability, a Monk his armour class bonuses, in return for predominantly offensive spells.

Most will feel the transition is worthwhile as the level one spells include the Earth Dagger that cuts down a group from 40 feet for 200-800 points of damage, Earth Song, reveals all the booby traps in the area and Earth Ward zaps them all. Then the spells can wipe a group of enemies from 50 feet. It costs 80 spell points but it's quite effective.

Bard's Tale III is not only bigger than the others it is also better as now a built-in map function guides you around the wilderness and provides dungeon maps while underground. If you look far enough you'll find the one and only tavern that's still serving drinks to top up your bards, a shrine for some quick but pricey cures and the refugee camp where you can add new characters to your party. You can now also save the game at any time and any place which cures one of the minor quibbles that spoilt it's predecessor.

The result is an extremely playable and enjoyable game that's the software equivalent to a good book as you just won't be able to put it down. I've been exploring the game for days now and have a party of level nine characters that are now ready to delve deeper into the game. However, I'm still a long way from reaching another dimension or even deciphering the three level cardboard wheel included in the game box.

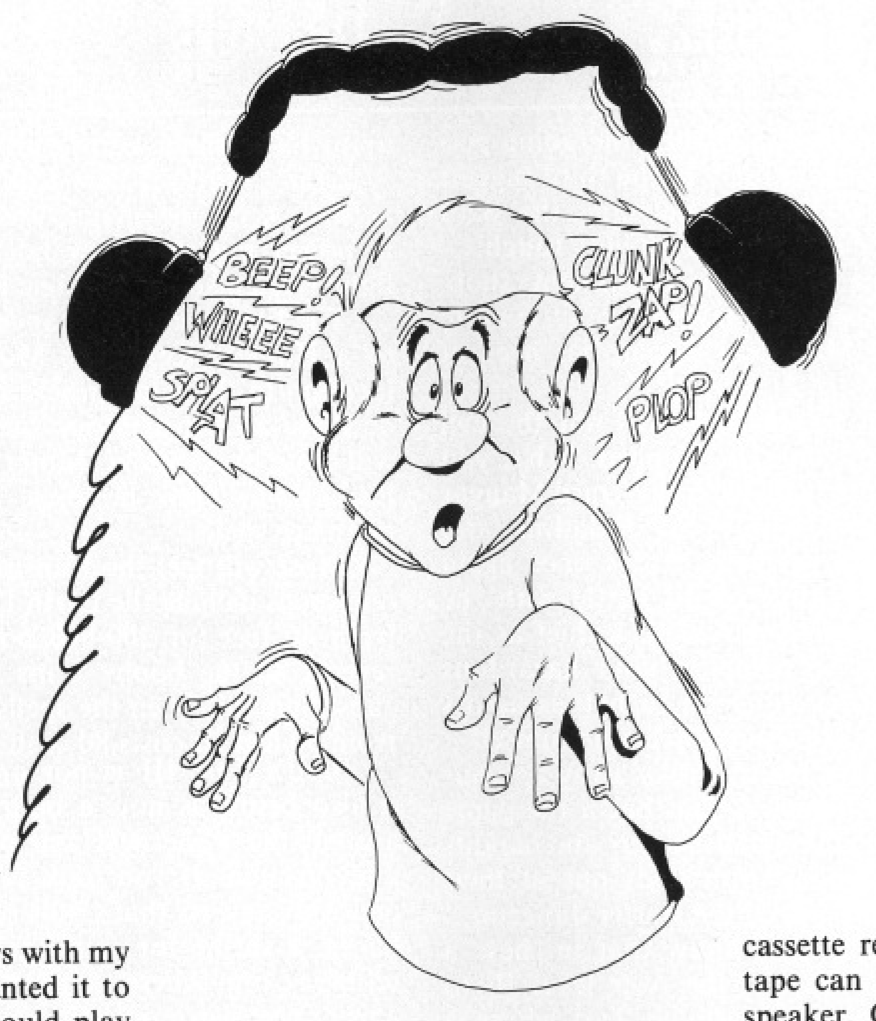
If you want to cut corners you can load in your party from Bard's I or II but I wouldn't recommend it. Instead savour every minute of this exceptional game. **T.H.**

***Touchline:***
***Title:*** *Bard's Tale III – Thief of Fate.* ***Supplier:*** *Electronic Arts, Langley Business Centre, 11-49 Station Road, Langley, Nr Slough, Berks. SL3 7YN.* ***Tel:*** *0753 49442.* ***Machine:*** *C64.* ***Price:*** *£14.95.*

# C64 Sampler

*OK, so the sound out produced using this program may not be studio quality but playing with your own sound samples is great fun!*

***By S.R. Thom***




Ever since my early days with my trusty C64 I have wanted it to sample sounds so I could play them backwards, forwards and at different speeds. The only way that I was able to do this was by using fairly expensive hardware. Until now that is.

*C64 SAMPLER* uses just your C64 and Commodore cassette recorder to sample sounds. Although the sample quality is not as good as an expensive sampler some excellent results can be achieved.

The program allows you to create two different types of samples. The first type of sample lasts for about two seconds and can be cropped and played forward or backwards at different speeds. The second sample lasts quite a bit longer at around 13-14 seconds. However, this cannot be played at different speeds.

## Getting Going

When you start C64 SAMPLER a menu appears that will offer you the following choices:

1.. Cue tape
2.. Sample (L)
3.. Sample (S)
4.. Play Sample
5.. Menu 2
6.. Quit

The first option allows you to cue your tape to the correct position for your sample. When you press play on the cassette recorder, whatever is on the tape can be heard through your TV speaker. Once the tape is positioned correctly, press the spacebar and you will return to the main menu. The tape will stop at its current position and not turn again until you either select option 1 again or select one of the sample options.

The second and third options are the two sample options. Selecting the option 2 makes a long sample of the sound. To use it you must first press play on the tape before selecting the option, otherwise you will end up by loosing valuable sample time while pressing play. The same applies for the short samples (3).

Play sample, plays back the sample which you have just made. If there isn't one in memory then this command will not work.




Option 5 moves you onto the second menu which is explained later.

The last option allows you to quit the program, to restart it type in RUN. If you had a sample in memory at the time of exiting the program. Type **SYS 2080** to return to the program without losing the sample.

## MENU 2

The second menu has options which allows you to play the sample forwards, backwards and change the speed. The second menu has the following options:

1. Play sample in reverse
2. Change the speed of sample (S)
3. Manual play (S)
4. Crop sample
5. Screen help
6. Kill sample
7. Main menu

Note the options with an (S) on the end indicate that this is for short samples only.

Option 1 is self-explanatory. Upon pressing 1 you are asked if you wish to play the sample backwards or forwards.

To change the speed of the sample use option 2. This will only alter the speed of a short sample. The current speed of the sample is shown. Pressing the '+' sign increases the number, decreasing the speed and the '-' sign to decrease the number, increasing it. This option changes the speed of playback for both forwards and backwards playing. To exit press the runstop key.

The manual play option, which again only works when a short sample has been made, allows you to play your sample, cropped or otherwise, at set speeds either backwards or forwards. It is similar to a piano only the samples do not play a proper scale. The keys used are **Q,W,E,R,T,Y,U,I,O,P** which play the sample forward at different speeds starting with the slowest speed assigned to **Q** and the fastest speed assigned to **P**. Keys **A,S,D,F,G,H,J,K,L,** play the sample backwards at different speeds. Press the runstop key to end this selection.

If there is a small part in your sample which you wish to extract and play back then you use the crop sample option. This gives you the choice to restore the values back to default so you can hear the whole sample again or crop the sample. When you select to crop the sample press *SPACE* to start the sample. To mark the beginning of where you want to crop the sample press the *CTRL* key then press *SPACE* to mark the end of your sample. When you press *SPACE* the sample will stop and the new sample can be played back by selecting option one and pressing 'F' for forward. If you make a mistake then simply do the same process until you get the sample you require. Pressing Run Stop returns you to menu 2 again.

Menu option 5 gives on screen help just in case you get into a muddle. The on screen help is only very brief.

The last option is kill sample. If you get fed up of your sample then select option 6 and the computer will ask if you wish to clear the computers memory. At this prompt you should either press Y or N.

## How It Works

When I produced the program I tried to keep as much memory as possible free for the sample area. The program has 1024 bytes of machine code low in memory between $0801-$0C00 or for those who prefer it in decimal 2049-3072. This merely contains the shell of the program such as the menu drivers. The actual sampling routines are located under the Kernal ROM at $E000-$FFFF or 57344-65535. Not all this area is actual coding. The first half of the Kernal contains the screens for the two menus. Each screen takes up 2K bytes of RAM. 1K for the screen data and 1K for the screen colours. The actual code starts at $F000 or 61440. The Help screens are located under the VIC/SID I/O area which is at $D000-$E000 or 53248-57344. There are four screens each 1K bytes long. In order to get at all these routines some bank switching has to be done.

I had thought of placing the whole program under the Kernal ROM but then hit upon a problem when I wanted to use kernal routines such as the *Chrout* routine. This was because when the kernal is switched out you are unable to use it until you switch it back in again. I decided to split the program and have half of the program in the Basic area of RAM and the rest under the ROMs.

The actual sampling routines are quite simple. They use the same idea as the normal kernal loading routines. The key location is $DC0D or 56333. This location changes when a tape is playing into the computer. Bit 4 of $DC0D is altered and can be either set or not. When it is set then the computer pokes 54296 with 15 thus producing a click. When the bit is not set then a 0 is placed in 54296. This has to be done very quickly in order to get the best quality sample. All interrupts are turned off and the screen is blanked to get as much speed out of the computer as possible. Because there is only one bit affected the sample is unable to reproduce amplitude, if it samples something too quiet then it will only pick up small parts of the sound. The short sample routine is the simplest because the computer reads the location $DC0D and checks to see if bit 4 is set. If it is then it not only places 15 in 54296 but also places it in RAM. If the bit was not set then

it places a zero in RAM. By the end of the sample the memory between $0C00 and $D000 will be full of either $0F's or $00's.

It becomes an easy task to reproduce these sounds once in memory by reading them back out of memory and storing them directly into 54296. However, this is a waste of good memory only storing one bit of information in an eight bit memory location. I therefore made a routine which reads $DC0D and checks if the bit is set or not. If the bit is set then the computer sets the carry flag. If the bit is not set then the computer clears the carry flag. Then the carry flag is rolled onto an eight bit number. This is repeated eight times so that at the end you get an eight bit number containing eight times more information than the previous method. This is then stored in memory. Then to play back the sample the bits are rolled back into the carry flag. If the carry flag is set then $0F is placed in the SID volume and if the carry is clear then $00 is placed in the SID volume (54296). That is all there is to it. The reason why you can not change the speed of a long sample is because the routine is too long and can only just playback the sample at the normal speed.

While writing the program I was going to add a load and save feature but decided against this when I realised that it would take far longer to save the sample to either tape or disk than it did to make the sample in the first place.

## Getting it all in

The program is quite large and will take quite a bit of typing in. There are three sections to it which need to be typed in. When they are all correctly typed in the programs will read the data and store it in the basic area starting at $0801. It is for this reason that there is a little boot program which is to be typed in and run first. This program relocates the start of basic by poking locations 43 with 1 and location 44 with 64 and then performing a NEW. The program then loads the first data loader called DATA1. When run DATA1 will read the code and start to store it in memory. When this has been done the program will load DATA2 into memory and will run. Then when this program has finished it will load the final data loader called DATA3. When this has read all the code it will ask you to press return to save the program. Ensure, if you are saving to disk, that you have a disk with enough space on it, about 47 blocks or more should be enough. If you are using tape then you should change all the ,8's you see to ,1's.

All the programs have a checksum at the end of each line. However if the program gives an error and the line number it gives you does not have an error in it then try looking at the line before it or the line after it.

## Hints and Tips

When sampling a sound it is best to look for sounds which are not too complex and are clear. A whistle will sample quite well. It is best to experiment with different sounds and see how well they sample. You could start by sampling a Commodore 64 computer tape. YC




# F.S.S.L

## FINANCIAL · SYSTEMS · SOFTWARE · LIMITED

### ▶ BASIC 8

Unleash the hidden graphics power of your 128. At last, your Commodore 128 can rival the 16 bit micros! Imagine your 128 in 80 columns producing a resolution of 640 x 200 in mono and 640 x 192 in 16 colours without any additional hardware! (640 x 400 version available soon.) Sounds impossible? Not with Basic 8, the new graphics language extension.

Basic 8 adds over 50 Hi-Res graphic commands to C128 Basic. Just select one of the many graphics modes and draw 3-D lines, boxes, circles and a multitude of solid shapes with a single command. We've even added commands for windows, fonts, patterns and brushes.

To demonstrate the power and versatility of this graphics language, we have created Basic Paint, a flexible icon-based drawing application program. Basic Calc, a full featured spreadsheet and Basic Write a simple to use word processor with a multitude of fonts. Also included is an icon based desk-top utility which provides quick and convenient access to each of your own Basic 8 creations.

All this graphics potential is yours for **£34.95**, 64k Video RAM upgrade kit **£19.95** and The Beginners Guide to Basic 8 with disk **£19.95**.

### ▶ 1541/71 Disk Drive Alignment Package

Problems with your disk drive? The alignment package reports the alignment condition of the disk drive as you perform adjustments. On screen help is available while the program is running. Includes features for seed and head stop adjustment. Allows you to test each full and half track as you realign the drive. Complete instruction manual on aligning both 1571 and 1541 drives. Even includes instructions on how to load the alignment program when nothing else will load. Works on the C64, SX64 and 128 in 64 or 128 mode. **Only £24.95.**

### ▶ 1571 FIX ROM

Are you experiencing any of these problems with your 1571 disk drive, Errors when using Superbase? Device Not Present Errors? Major problems when 2 or more open files? Takes forever to recognize a flippy disk? If you have one or more of these problems then you need 1571 FIX ROM, developed by Commodore Inc USA, just plugs in, solves over 19 main problems. **Only £24.95.**

### ▶ Commodore 1581 Disk Drive

The New Commodore 1581 drive is now available for the C128 or C64. This drive offers one megabyte of memory, THREE THOUSAND ONE HUNDRED AND SIXTY blocks free, (800K formatted capacity), and a very fast EIGHT

continued

THOUSAND Characters per second loading rate. Software for this new drive includes, VizaWrite Classic, HackPack, Petspeed, Oxford Pascal, CAD PAK, Chart Pack, Fontmaster, Spellmaster and much more. Using a package called Super 81 Utilities most software can simply be copied across to the new format. The drive is available for **£184.95.**

▶ You don't need a new computer to join in the desktop publishing revolution! With Page Builder and Page Illustrator from PATECH Software, your Commodore 128 can compose professional-looking pages.

Page Builder and Page Illustrator are stand alone programs; each with a specific function to perform. Whether used singly or as an unbeatable team, the Two Constructive Ideas are designed to make maximum use of the C128's native power. They were created by publishing professionals who put that power where you need it most – into real performance and utility, not bells and whistles.

### ▶ Page Builder

Bring the power of personal publishing to your C128. Integrate text and graphics to construct everything from high quality newsletters to professional business forms and presentations. Layout and design is quick and straight forward import text created with your word processor. Wrap it around graphics created with Page Illustrator, then change the look by using a different font or repositioning graphics. **Only £49.95**

### ▶ Page Illustrator

At last, an 80-column high-resolution drawing package that's powerful and easy to use. Create colourful graphics or have Page Illustrator assist you in drawing simple geometric figures. Create clip-art from any portion of the screen, then mirror, reverse, or flip it. Import graphics from popular drawing packages for your own creations. Page Illustrator is a window and Icon system presented in the Amiga Desktop style. **Only £29.95.**

### ▶ The CP/M Kit & Users Guide

The CP/M Kit introduces and explains the unknown, third mode of the C128. The CP/M Users Guide is a 300 page book by Abacus Software covering all aspects of CP/M. Subjects which include the system disk, resident commands and disk copying are described in detail. The CP/M kit contains over 20 CP/M programs including a word processor, chess game and a disk cataloguing program accompanied by a detailed guide to running programs in CP/M. The CP/M kit and Users Guide. **Only £34.95.**

### ▶ Super Disk Utilities

The ultimate utilities disk for the 1571 disk drive and C128 computer. Copy whole disks with 1 or 2 drives, change disk format, perform CBM DOS, CP/M and MS-DOS utility functions, scratch, unscratch, lock and unlock files, write protect disk, contains disk editor, drive monitor, unique RAM writer and more. **Only £24.95.**

### ▶ The Big Blue Reader

New from SOGWAP Software Inc., The Big Blue Reader is ideal for those who use IBM PC compatible computers at work and have the Commodore 128 or 64 at home. The Big Blue Reader is not an MS-DOS emulator, but rather a unique and easy way to transfer word processing, text and ASCII files between two totally different formats, Commodore and MS-DOS. The Big Blue Reader requires a 1571 on both the Commodore 128 and 64 and will not work with a 1541 or similar drive. **Only £34.95.**

### ▶ The Drive Box

The drive box allows you to easily change the device number (8, 9, 10, or 11) of your 1541, 1571, 1570 or 128D computer. It will, as a bonus, allow you to bypass the write protect sensor, allowing you to write to the back side of the disk without cutting a notch. Installation requires a little soldering. **Only £19.95.**

| | | | |
|---|---|---|---|
| ● Merlin 128 Assembler | £49.95 | Commodore 128D | £374.95 |
| Chartpack 128 | £29.95 | 1571 Disk Drive | £184.95 |
| CADPAK 128 | £29.95 | 1901 Monitor | £210.95 |
| Super C | £39.95 | Anatomy of 128 | £9.95 |
| Cobol 128 | £29.95 | Anatomy of 1571 | £9.95 |
| Super Pascal | £29.95 | Peeks and Pokes | £9.95 |
| HackPack 128 | £14.95 | CAD on 128 | £9.95 |
| RAMDOS | £29.95 | Tricks and Tips | £9.95 |
| Petspeed 128 | £14.95 | | |
| Word Writer 128 | £39.95 | | |
| Swiftcalc 128 | £39.95 | | |
| Data Manager 123 | £39.95 | | |
| Fontmaster 128 | £49.95 | | |

Access VISA

● Order with Access, VISA, cheque or Postal Order, COD and Express delivery available, foreign orders add £2.50 per package. Prices include VAT and postage. Please allow 14 days for delivery.

**18 High Street · Pershore · Worcs · WR10 1BG · Tel: (0386) 553153**

# Disk Monitor

*Talk directly to your disk drive with this handy utility for the C16 and Plus/4*

**By Mark Jaycocks**

Disk Monitor is a utility program for the C16 and Plus/4 primarily written to get access to the drive's internal memory and to unscratch, lock or unlock any file on disk. It has these facilities and many more to make it into a powerful disk utility. Some of the commands write directly onto a track and sector so it is advisable to make a copy of the disk before starting, as one error could possibly damage the disk you are working on and make the data unrecoverable.

## Typing It In

Type in the program **CHECK LOADER** and RUN it. Once executed type **MONITOR** to enter **TEDMON** (the built in machine language monitor). Now type **S"MEM CHECKER 600" 8 600 686** and Press RETURN. This is used later on to check that the data is entered correctly.

Type **F 1000 3FFF 00** and Press RETURN. This clears the memory from $1000 to $3FFF. Type in the **MONITOR M/C** listing, once entered type **L"MEM CHECKER 600" 8** and press RETURN. This will enter the check program into memory. To check the program type **G 600 3 1000 37EC**. Change the 3 to a 4 for use with a printer. To pause the listing press CTRL+S or use the commodore key to slow it down. Check the listing against **TABLE 1** and if there are any differences then check the corresponding piece of memory. To save the program type **S"FILENAME" 8 1001 37EC** and press RETURN. To exit from monitor type **X** and press RETURN. Execute the program type **sys4112** or type RUN and press RETURN.

## Commands

The commands are presented (apart from the commands in monitor and memory) in menus. All numerical inputs and outputs are in hex.

## Main Menu Commands

**DISK** –upon selection another menu called DISK MENU is presented.

**FILE** – upon selection another menu called FILE MENU is presented.

**MONITOR** – this command allows you to view and alter specified sectors. It works in a similar way to TEDMON and has the following commands.

+ – this will read the next track and sector into the buffer.

X – this returns you to the MAIN MENU.

> **aa** xx xx xx xx xx xx xx xx – this command alters up to 8 bytes of memory from the specified address in the buffer.

**M** xx xx – this command will display memory from the buffer in the specified range. If the address is omitted then the first 8 bytes of the buffer will be displayed.

**R** xx xx – this command will read a track/sector directly off the disk into a buffer in the computer.

**W** xx xx – writes the buffer to the specified track/sector.

**DATA MAKER** – this coverts a program file into data statements and writes them back to the same disk under a different filename.

**PRINTER OPTIONS** – this command produces another menu called PRINTER OPTIONS.

**EXIT** – this returns you to basic. Re-entry to disk monitor is done by typing SYS4112 and pressing RETURN.

**TABLE 1**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | 52 | 1050 | 1E | 10A0 | CF | 10F0 | 4A | 1140 | 3D | 1190 | 16 | 11E0 | 35 |
| 1230 | FE | 1280 | B2 | 12D0 | F2 | 1320 | C9 | 1370 | EC | 13C0 | F5 | 1410 | 8D |
| 1460 | 24 | 14B0 | 3B | 1500 | C1 | 1550 | 17 | 15A0 | 67 | 15F0 | DF | 1640 | 74 |
| 1690 | CF | 16E0 | D7 | 1730 | ED | 1780 | 2E | 17D0 | 6F | 1820 | 5A | 1870 | 7D |
| 18C0 | 74 | 1910 | E7 | 1960 | D0 | 19B0 | 06 | 1A00 | 09 | 1A50 | 00 | 1AA0 | 52 |
| 1AF0 | B8 | 1B40 | C1 | 1B90 | 65 | 1BE0 | 5D | 1C30 | 82 | 1C80 | 07 | 1CD0 | 3C |
| 1D20 | EB | 1D70 | E8 | 1DC0 | AD | 1E10 | 10 | 1E60 | 28 | 1EB0 | B6 | 1F00 | 41 |
| 1F50 | 19 | 1FA0 | 8D | 1FF0 | BE | 2040 | 22 | 2090 | 3B | 20E0 | A5 | 2130 | BE |
| 2180 | 7F | 21D0 | EF | 2220 | AF | 2270 | C6 | 22C0 | E1 | 2310 | EE | 2360 | 20 |
| 23B0 | D5 | 2400 | 62 | 2450 | E2 | 24A0 | D1 | 24F0 | FF | 2540 | CB | 2590 | 67 |
| 25E0 | CD | 2630 | 7C | 2680 | 2F | 26D0 | 4A | 2720 | B6 | 2770 | 1B | 27C0 | 09 |
| 2810 | 82 | 2860 | 95 | 28B0 | 8D | 2900 | C4 | 2950 | 87 | 29A0 | 8D | 29F0 | E6 |
| 2A40 | 8B | 2A90 | 50 | 2AE0 | 20 | 2B30 | 2D | 2B80 | D4 | 2BD0 | 8B | 2C20 | 66 |
| 2C70 | 74 | 2CC0 | 1E | 2D10 | B6 | 2D60 | BF | 2DB0 | 4B | 2E00 | B8 | 2E50 | C8 |
| 2EA0 | 6F | 2EFO | C6 | 2F40 | C8 | 2F90 | 85 | 2FE0 | B8 | 3030 | 2E | 3080 | 03 |
| 30D0 | 75 | 3120 | D4 | 3170 | 64 | 31C0 | 3E | 3210 | 0A | 3260 | CC | 32B0 | 11 |
| 3300 | A8 | 3350 | 1A | 33A0 | 95 | 33F0 | D8 | 3440 | 3B | 3490 | 11 | 34E0 | C9 |
| 3530 | 82 | 3580 | 41 | 35D0 | E3 | 3620 | BE | 3670 | 98 | 36C0 | 80 | 3710 | EA |
| 3760 | D0 | 37B0 | 26 | | | | | | | | | | |

## Disk Menu Commands

**DRIVE** – this allows you to change the drive you are working on. (0-1)

**UNIT** – this allows you to alter the disk unit you are working on. (08-0F)

**DIRECTORY** – this displays the directory of a disk giving the size of the file, the track and sector of the first block of the file, the filename and filetype including deleted files. If the file is a program file then the start address is given.

**COLLECT** – this command frees up space allocated to improperly closed files and deletes reference to them from the directory. If a file has been unscratched from the monitor by setting byte 2 in a scratched file entry from $81 to $84 or $C1 to $C4 then this will allocate blocks to that file.

**INITIALISE** – this command initialises the disk drive and re-reads the current diskettes BAM (Block Availability Map) into the drives internal memory.

**FORMAT DISK** – this commands prepares a new diskette for use. If a disk has previously been formatted then omitting the i.d. number will perform a quick format, which just clears the disk's directory.

**ALTER HEADER** – this allows you to change the disk's name and i.d. number.

**VIEWBAM**– this allows you to view the Block Availability Map and to see which blocks are free or allocated.

**EXIT** – this returns you to the MAIN MENU.

**MEMORY** – this allows you to view or alter the drives internal memory. It works like TEDMON and has the shown commands.

**X** – this exits the memory command and returns to the DISK MENU.

**M**xxxx xxxx – display contents of the drives memory between specified address range. If the address is omitted then one page of data is printed.

> xxxx xx xx xx xx xx xx xx xx – used to alter between 1 and 8 memory locations, from the specified address, at a time.

**G** xxxx – to executed a routine in the drives memory.

**T** xxxx xxxx xxxx – to transfer a block of memory to another location in memory.

**H** xxxx xxxx **data** – to search for the specified data between the specified address range. Ascii data must be preceded by a ′ and multiple data or hex codes must be seperated by a space. Upto 32 bytes of data are allowed.

**F** xxxx xxxx xx – to fill the specified range of locations with a specified byte.

**D** xxxx xxxx – to disassemble machine code into assembly language between the specified address range. If the address is omitted then one page of data is printed.

**A or .** xxxx opcode operand – to enter a line of assembly code.

**P** – this command when preceding the M and D commands will divert output to printer.

**S"file name"** xxxx xxxx – this saves the contents of the specified memory, upto 255 bytes long, as a utility user program. This program can be loaded in by typing in basic OPEN 15,8,15,"&0:filename":CLOSE15: This works on the 1551 by loading the user program into the disk's internal memory, to the place it was previously saved from, and then executing it.

**L"filename"** – this is the same as the DOS command "&0:filename"

## File Menu Commands

**TRACE** – this will trace a specified file, and display all sectors belonging to that specified file.

**LOCK** – this will lock specified files allowing those files to be write protected so that they cannot be scratched via the scratch command.

**UNLOCK** – this is the opposite to the above.

**SCRATCH** – this command will delete any unwanted files (accept locked files) from disk.

**UNSCRATCH** – this command tries to recover any erased file from the disk.

**ALTER START ADDRESS** – this allows you to alter the load address of a program file.

**EXIT** – this command returns you to the MAIN MENU.

## Printer Options Menu

**ALTER DEVICE NUMBER** – this allows you to change the printer device you are working on. (4 –6)

**ENABLE PRINTER** – this activates a interrupt driven machine code routine which allows any screen to be printed to the printer by pressing SHIFT/CONTROL.

**DISABLE PRINTER** – this de-activates the interrupt driven routine.

**EXIT** – this returns you to the MAIN MENU.

## Disk Editing

All the necessary information needed to start you off can be found in :–

*YOUR COMMODORE DISK USERS HANDBOOK* (supplied with the December 87 issue of YOUR COMMODORE.)
*and*

*YOUR COMMODORE SERIOUS USERS GUIDE*

# Writing on the Desk

*Desktop publishing is the current computer buzzword, but what does it mean?*

***By Eric Doyle***

One man's desktop publishing program is another man's wordprocessor – the mere mention of DTP is guaranteed to create an atmosphere of confusion. In reality the true desktop system is the next stage on from word and image processing, the combination of pictures and text to form the finished printed page.

The C64 has several utilities available which can all be described as desktop products but each takes the principal one step further along the pathway to true, finished page production. At the rudimentary end comes The Print Shop, Newsroom takes things one step further and joint top honours go to Geowrite and Stop Press

This covers the range from simplicity to sophistication but, although the top two programs can serve many of Print Shop's functions, each program has its own target audience. Sophistication means complexity and expense, if your needs are humble why buy a Porsche when a Fiat will do.




## The Print Shop

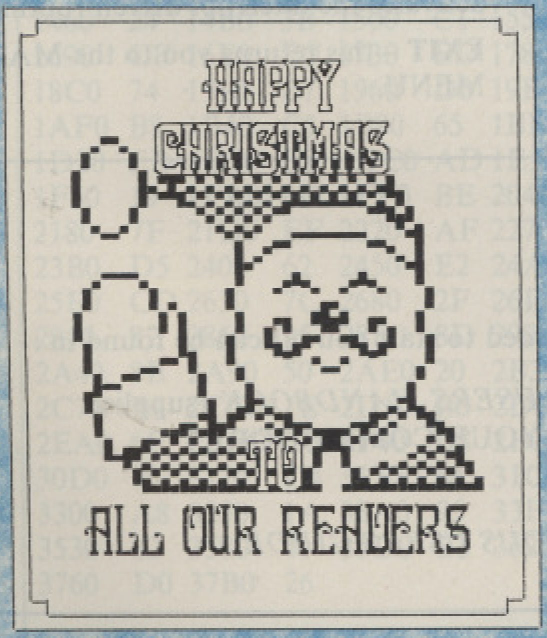
This program is aimed at Bill Stickers and his kin. The program produces respectable signs, letterheads, birthday cards and banners for all occasions from personalised greetings to jumble sale flyers.

The Print Shop has a rigid structure of sequential menus which means that anyone can use it with a minimum of tuition. A typical page would consist of a border surrounding text with a large single image or several repeated images set around the page in one of several fixed grids. The text can be superimposed over the illustrations or can be skilfully planned to surround the images.

Artwork for the illustrations can be self-designed using The Print Shop graphic editor or modified from a library of images which is commonly known as clip art. Don't expect images of great complexity, they are cartoon line drawings which vary in quality from silly to sensible: something for everyone.

Text space is at a premium with only ten, 18 character lines at your disposal but with a little judicious editing this could prove more than enough for most small notices. The text is entered into the program via a very crude wordprocessing system which is little more than a series of input lines which allow little more than centring or left/right justification.

An additional kaleidoscope generator routine is included so that a psychedelic pattern can be created. This can then be used as a pretty wild background for any notice that is produced. The patterns are really wild, freaky, sixties stuff which would probably look great if the caption read 'Peace, man', still if flower power ever makes a comeback you could corner the poster market.






## The Newsroom

Like The Print Shop, the structure of Newsroom is fairly rigid and offers the user options rather than creative freedom but it is one step closer to professional DTP.

Newsroom splits the page into 'panels' which are individually designed and then assembled at the print stage. The panels represent an eighth of a page block which gives dimensions of a quarter of an A4 page in height and half its width. Documents produced in this way would therefore consist of two columns of four panels. The title page can use a modified form of this arrangement by combining the top panels in each column to form a banner for the title of the newspaper.

The page is created from the Newsroom's graphic menu which shows the various departments of the production team in cartoon form. By selecting the Photo Lab, Copy Desk, Banner, Layout, Press, or Wire Service departments, the program will take you to the relevant area of the production cycle.

First impressions are important and the banner design is important because it gives the publication its identity in true newspaper tradition. The special format of this section allows larger letters to be used across the top of the page and this can be given a personal touch by adding clip art items from Newsroom's own library.

Letters can be selected from a bank of five fonts: small and large serif and sans serif or large old English. The restriction is for one small and one large font for each panel but any combination can be used for the banner.

Once the banner design is complete, the individual articles can be added to the page. On a banner page only six panels are allowed. Each panel is created separately so pages have to be carefully planned before starting.

The page is split into two columns of three panels which can mix clip art and text. The two column format cannot be disguised but each column can be given continuity by running text on from one panel to another. With care, even clip art can be split across the boundary of two of the panels.

Although the word clip art is usually being bandied around, it's not quite as simple as this. The clip art has to be processed first in the Photo Lab where an image can be built up from individual items and art library images. Like Print Shop, the art consists of a range of cartoons which can be modified through the Lab's graphics toolbox.

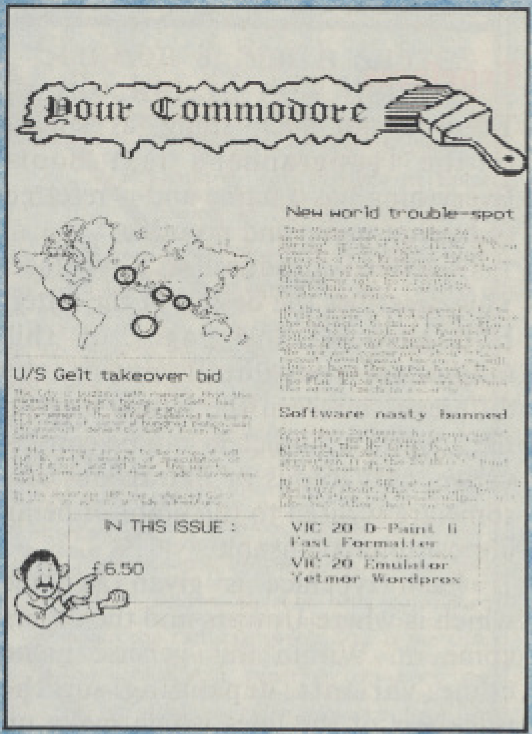
After processing the image, it can then be 'photographed' and stored in a photo library for inclusion in a panel. Photographing merely consists of creating a window around the image and then saving that area to disk.

Once all of the page sections have been created the selected layout can be printed out and the newspaper has gone to press.

The Wire Service option plays no part in the creation of the page. For most people it will be a redundant option because it is devised to allow a page to be transmitted through a modem.

Throughout this description, the Newsroom page has been described as a banner and six panel or as an eight panel sheet. This is true if the normal A4 paper size is used. There is an option to use longer printout sheets on 14 x 8 inch paper and this allows ten panels to be fitted on a page.

The Print Shop uses standard text menus for feature selection but Newsroom moves into the realm of WIMP (windows, icons, menus and pointer) systems by adopting icon option selection. The two products also differ because with Print Shop the designer does the job 'blind'. In Newsroom the screen display shows the panels as they will appear on the final printout. Colloquially, this is known as a 'what you see is what you get' approach, which is where the term WYSIWYG (pronounced wizeewig) comes from. So Newsroom could be described as a modular, icon-driven, WYSIWYG publishing program.




## The Jargon Jungle

Step into the realm of DTP and you step into a world surrounded by jargon. A blend of computer speak and printers' terms, the new language needs a bit of clarification before continuing with the top range programs.

The basic informative medium is the written word. This simply consists of letters. Did I say simple? A letter has size, shape and weight, a typographer can wax lyrical about Univers, Baskerville, Helvetica and Times. They speak boldly about lightweight



typefaces, point excitedly at the various sizes of letter available and talk fondly of fonts they have known and loved.

## Typefaces

There is no such thing as simple in the typographer's text book. Everything has a name and is referred to by that name and no other.

A letter is produced as a typeface. This describes the design of the letter. Flip through the pages of this magazine and you'll notice the difference between the letters used in the adverts. Characters can be conservative, curvaceous or outrageous and some are stylised to the point of being almost unrecognisable.

Each typeface is given a name which is where Univers and the others come in. Within this generic name come variants depending on the thickness of the lines which make up the letter. In this way the names become modified into ranges like Helvetica Light, Helvetica Medium and Helvetica Bold. In the typesetting world this is known as a font and this is the basic unit in which a typeface is purchased for DTP purposes.

Point size is a measure of the height of the characters and is taken as the distance from the bottom of the descender on letters like 'y' and 'g' to the top of a capital letter or an ascender on 'b' and 'l'. A point is a unit of measure and there are 72 points to the inch. 'By' is a word which spans the full point size of the current font and most magazines use 9pt or 10pt characters which is just under an eighth of an inch.

## Leading

The gap between lines of text is known as the leading (pronounced as ledding). This stops ascenders and descenders from running into one another. Sometimes this space is also called the linefeed which can cause a bit of confusion in the minds of computer users because a linefeed on a printer is measured from the top of a row of letters rather than from the bottom of a descender.

When a page is designed the text and picture areas are marked out within a margin which is known as the gutter. This is sometimes used to describe the gap between a left and right page but correctly it is the continuous area around the page which may be partially removed when the finished magazine is trimmed. If an illustration is laid across this area it is said to bleed off the page (all this talk of bleeding into the gutter sounds pretty revolting to me). Unless it is a design feature, text should never be bled which is why the gutters are there.

A line of text can be justified or ragged. Justification gives a straight edge such as this column of text that you're reading. A *Your Commodore* column is described as right and left justified to make each line the same width despite the number of characters that it contains. The eveness of width is created by varying the space between words.

The alternatives are left justified, ragged (pronounced as ragg-ed) right; right justified, ragged left, or centred which produces a ragged right and left. To understand this think of a typewritten page. The carriage return makes sure that each line is vertically aligned but the right edge depends on how many characters are typed. The consequence is that each line has a different length and the right edge is jagged rather than straight.

## Proportional Spacing

The final terms which need explanation are proportional spacing and kerning. Letters have different widths and this can be seen by comparing an 'i' with an 'm'. Both characters are allotted the same space on a computer screen but this doesn't give a pleasing result. In printing a line of text each character is allotted a space which is proportional to its width, therefore an 'i' takes up less space than an 'm'.

Proportional spacing works for most circumstances but occasionally two letters are placed together which create spacial disparity. A capital 'V' beside a capital 'A' would align the tip of the 'V' with the foot of the 'A'. This looks wrong and would be improved if the two letters were placed together. This is a special case and can be solved by kerning. No this is not the art of pulling grotesque faces while framing your face with a harness or a toilet seat – that's gurning. Kerning allows one letter to be dragged towards its neighbour to eliminate these unsightly gaps.

Meanwhile, back at the range, the point has been reached to look at the more professional approach to desktop publishing as provided by Stop Press and GeoPublish.

The screen display has a page window with pull down menus above and icon options down to right. In a similar way to Newsroom, the page is created as a series of panels so a degree of pre-planning is necessary to get the overall layout sorted out before starting. Unlike Newsroom, the panels span the full width of the page and the panels have a generous overlap so that graphics or illustrations can be positioned accurately wherever you want them.

The screen acts as a window onto a section of the current page panel but a reduced, overall view of the panel can be displayed via one of the icons. Moving the screen view in the vertical plane is achieved by clicking the mouse button when the pointer is on one of the arrow icons. Alternatively, the view can be changed by selecting the overall view where a frame shows the current screen viewpoint. This frame can be moved freely over the panel and a new area selected for detailed viewing on the composing screen. This method is also the only one available for horizontal movement.

## Graphic Toolbox

Included in the icon menu is a graphic toolbox which is used to produce soft and hard dividing lines. The soft lines are used in defining text or graphics areas and don't appear on the printout. Hard lines are printable and can be used to form rules. These are separation lines between articles or frames around images. The toolbox is fairly sophisticated and can even be used to knock up a quick bit of instant art.

When text is entered from either a PRG or SEQ wordprocessor file, it can be made to either overwrite whatever is on that portion of the screen or flow around the graphics area according to your wishes. If the former option is activated, a special inverse option will cause the text, which is normally black on white, to automatically reverse to white when it overwrites a black background. No matter how uneven the transition line is, the inverter can cope.

The autoflow option can be used to skirt around pictures and designs to give a professional look to the page or to fill graphic shapes to give eye-catching effects. Even elipses and circles can be properly filled using autoflow.

Once defined, areas can be filled with predetermined shading or other patterns created with the integral

designer facility. Illustrations can also be pulled in from a clip art disk which contains images that are generally more stylish than clip art for Newsroom or Print Shop.

Self-drawn clip art files can be built up and the package includes an image convert so that the clip art for Newsroom or Print Shop can be converted for use by Stop Press. The big step upwards in graphics is the ability to include digitised images on the page. There is no information in the manual on how these images should be formatted for Stop Press but a digitising service is advertised on the back pages.

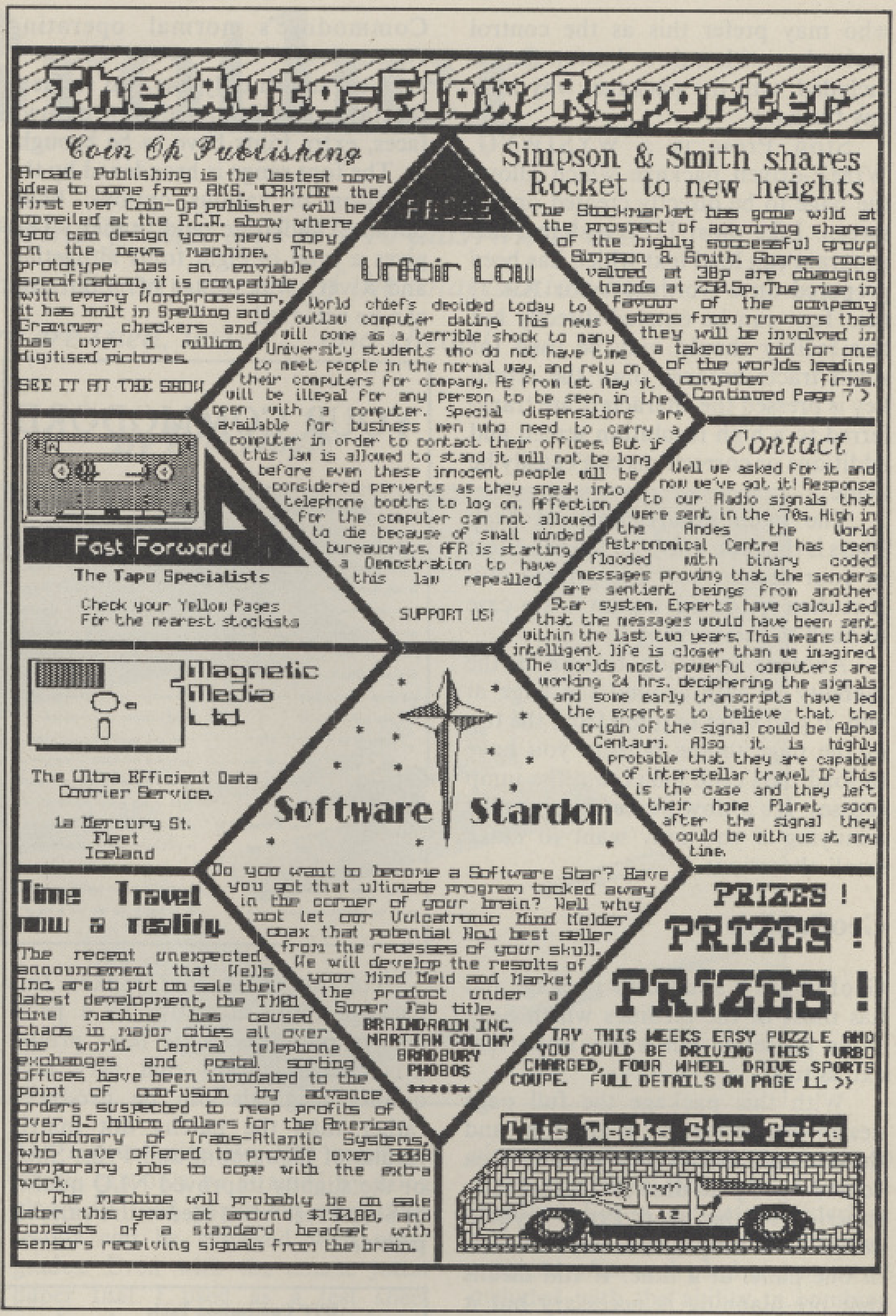
Another useful facility is the ability to zoom in on a small area of the page to fine-tune its appearance at pixel level. This can be used to allow kerning or just to clean up the artwork generally. Selected letters can be customised to create illuminated capitals to create the classical monastic effect.

If several characters need to be redefined, why not go the whole hog and produce a typeface of your own? Although there are 32 different fonts to choose from, the program includes a font designer so that the range can be extended at no extra cost. The new character set can then be saved to disk for future use.

Point size is not fixed as in Newsroom or Print Shop. Before the text is imported from the disk file the point size can be adjusted to suit headline or body text applications.

## Stop Press

Produced by AMS, it's not surprising that this is a mouse-driven package. A joystick option is included for those



# The Auto-Flow Reporter

**Coin Op Publishing**

Arcade Publishing is the lastest novel idea to come from AMS. "CAXTON" the first ever Coin-Op publisher will be unveiled at the P.C.W. show where you can design your news copy on the news machine. The prototype has an enviable specification, it is compatible with every Wordprocessor, it has built in Spelling and Grammer checkers and has over 1 million digitised pictures.

SEE IT AT THE SHOW

**Simpson & Smith shares Rocket to new heights**

The Stockmarket has gone wild at the prospect of acquiring shares of the highly successful group Simpson & Smith. Shares once valued at 38p are changing hands at 258.5p. The rise in favour of the company stems from rumours that they will be involved in a takeover bid for one of the worlds leading computer firms.

Continued Page 7 >

**Unfair Law**

World chiefs decided today to outlaw computer dating. This news will come as a terrible shock to many University students who do not have time to meet people in the normal way, and rely on their computers for company. As from 1st May it will be illegal for any person to be seen in the open with a computer. Special dispensations are available for business men who need to carry a computer in order to contact their offices. But if this law is allowed to stand it will not be long before even these innocent people will be considered perverts as they sneak into telephone booths to log on. Affection for the computer can not allowed to die because of small minded bureaucrats. AFR is starting a Demostration to have this law repealled.

SUPPORT US!

**Fast Forward**

The Tape Specialists

Check your Yellow Pages
For the nearest stockists

**Contact**

Well we asked for it and now we've got it! Response to our Radio signals that were sent in the 70s. High in the Andes the World Astronomical Centre has been flooded with binary coded messages proving that the senders are sentient beings from another Star system. Experts have calculated that the messages would have been sent within the last two years. This means that intelligent life is closer than we imagined. The worlds most powerful computers are working 24 hrs. deciphering the signals and some early transcripts have led the experts to believe that the origin of the signal could be Alpha Centauri. Also it is highly probable that they are capable of interstellar travel. If this is the case and they left their home Planet soon after the signal they could be with us at any time.

**Magnetic Media Ltd**

The Ultra Efficient Data Courier Service.

1a Mercury St.
Fleet
Iceland

**Software Stardom**

Do you want to become a Software Star? Have you got that ultimate program tucked away in the corner of your brain? Well why not let our Vulcatronic Mind Melder coax that potential No1 best seller from the recesses of your skull. We will develop the results of your Mind Meld and Market the product under a Super Fab title.

BRAINDRAIN INC.
MARTIAN COLONY
BRADBURY
PHOBOS
******

**Time Travel now a reality.**

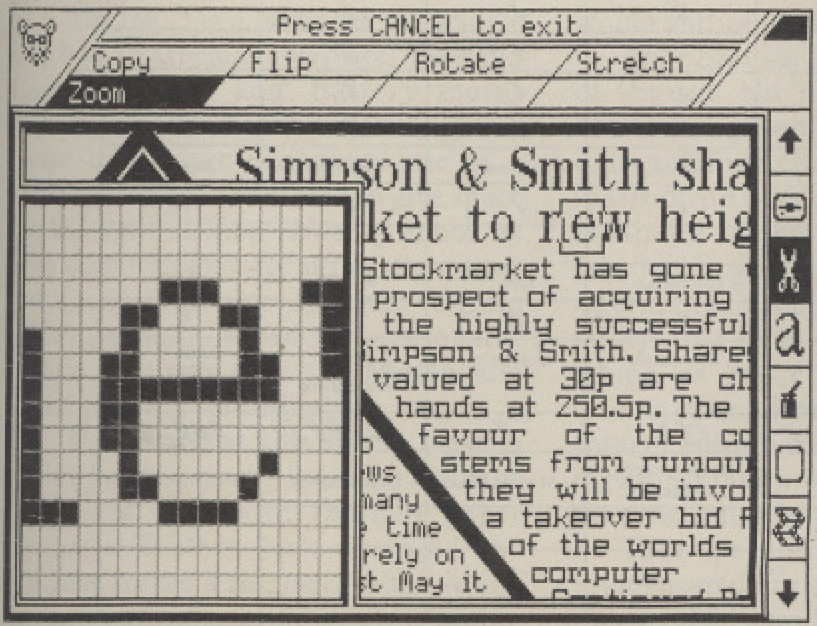
The recent unexpected announcement that Wells Inc. are to put on sale their latest development, the TM01 time machine has caused chaos in major cities all over the world. Central telephone exchanges and postal sorting offices have been inundated to the point of confusion by advance orders suspected to reap profits of over 9.5 billion dollars for the American subsidiary of Trans-Atlantic Systems, who have offered to provide over 3000 temporary jobs to cope with the extra work.

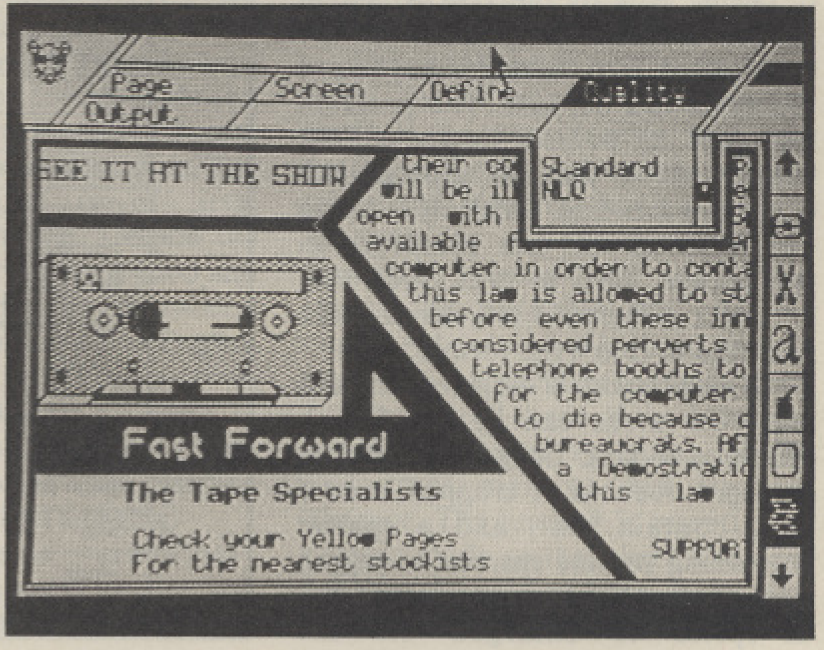
The machine will probably be on sale later this year at around $15100, and consists of a standard headset with sensors receiving signals from the brain.

**PRIZES! PRIZES! PRIZES!**

TRY THIS WEEKS EASY PUZZLE AND YOU COULD BE DRIVING THIS TURBO CHARGED, FOUR WHEEL DRIVE SPORTS COUPE. FULL DETAILS ON PAGE 11. >>

**This Weeks Star Prize**



who may prefer this as the control device but with a three-button mouse included with the package, why look any further?

Stop Press is a WYSIWYG, WIMP-driven package which allows the page to be directly created on the screen. Like most DTP systems, this program can load text which has been prepared on a wordprocessor ASCII file. Text can be entered directly but this facility should only be used for small tracts because once the return key is pressed the characters are transferred to a high resolution screen and additions or corrections can't easily be made.

The main disadvantage of Stop Press is that you don't see the full effect of your design until it is printed out. If it then needs tidying up, it's a case of back to the drawing board.

Another irritating feature is the inability to skip around the page at will. If you want to jump from the top of the page to the bottom you have to load pass each panel that the jump crosses. It's a slow process and can be annoying if you only want to make small alterations.

## GeoPublish

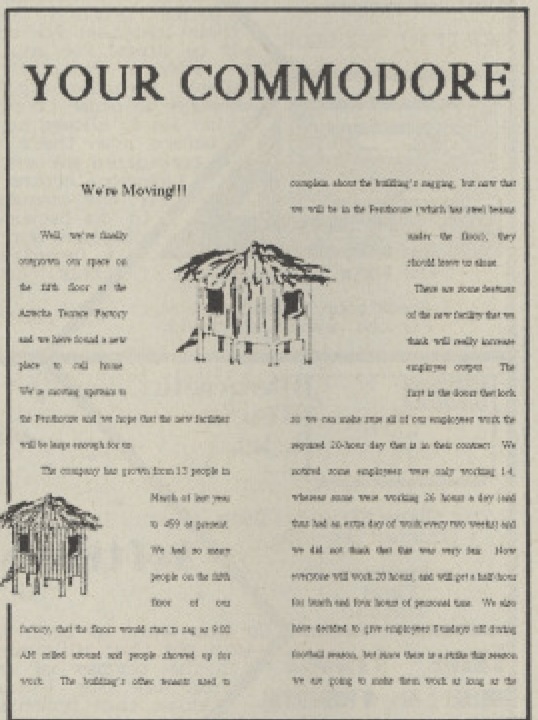
GeoPublish is a full DTP package and has most of the facilities which Stop Press possesses but a few important extras too.

With this package the full page design can be viewed at any time and the screen can zoom in on any area according to your desires. This is vastly superior to the Stop Press keyhold design that only allows an overview of one panel at a time. It still means that pre-planning is necessary but it can be altered at any stage if an effect does not seem to be working out.

Being part of the GEOS system means that the program is mouse controlled but certain keyboard shortcuts can be used. The program can only be booted via the GEOS master disk so the user must acquire a copy of this first. Similarly, owning GeoWrite as the text source is an advantage but a text grabbing program is included to convert other WP files to GeoWrite format.

A page layout is designed first and then the areas can be filled with graphics or text. Images can also be enlarged, reduced or cropped, even if they contain text, and a special smoothing routine ensures no jagged edges such as those which appear when a sprite is enlarged on the Commodore's normal operating system.

GeoPublish only has two resident typefaces and cannot design its own faces, extra fonts have to be brought in. The font range is broadened by the inclusion of various options: bold, outline, underline and italics. This gives a total of eight fonts altogether and a very wide range of point sizes can be achieved.




The attribute that makes this package more attractive to a prospective publisher is its laser printer driver. This means that very high quality originals can be produced rather than the patchy dot matrix results of Newsroom and Print Shop or the slightly improved NLQ quality of Stop Press when used with a suitable printer.

The Stop Press pixel editor is not duplicated which would have enhanced GeoPublish immensely and there is no facility for using digitised images which would work very well on a laser printout.

## Conclusions

A true comparison isn't really viable because the application depends on the user's individual need.

Print Shop is an amusing product with serious applications for those who only need to produce the odd poster. Its simplicity is its main strength and it can be useful when an impending birthday is remembered at the last minute, after the shops have closed!

Newsroom is a good introduction of the DTP world and could be used by schools and clubs to produce a newsletter. The Clip Art library is large and comprehensive but there is a heavy bias towards Americana which indicates its source.

Stop Press is for the serious user who has to produce a better quality document. It is a once and only buy because everything that you need is supplied, including the mouse.

GeoPublish is the top of the range DTP package for the professional. Its laser interface is its strongest recommendation though I preferred the range of facilities included in Stop Press.

The only observation I would make is that, if AMS redesigned their package to give a full page layout display and a laser driver, Stop Press would be the one for me. As this is unlikely, I'll stick with GeoPublish.

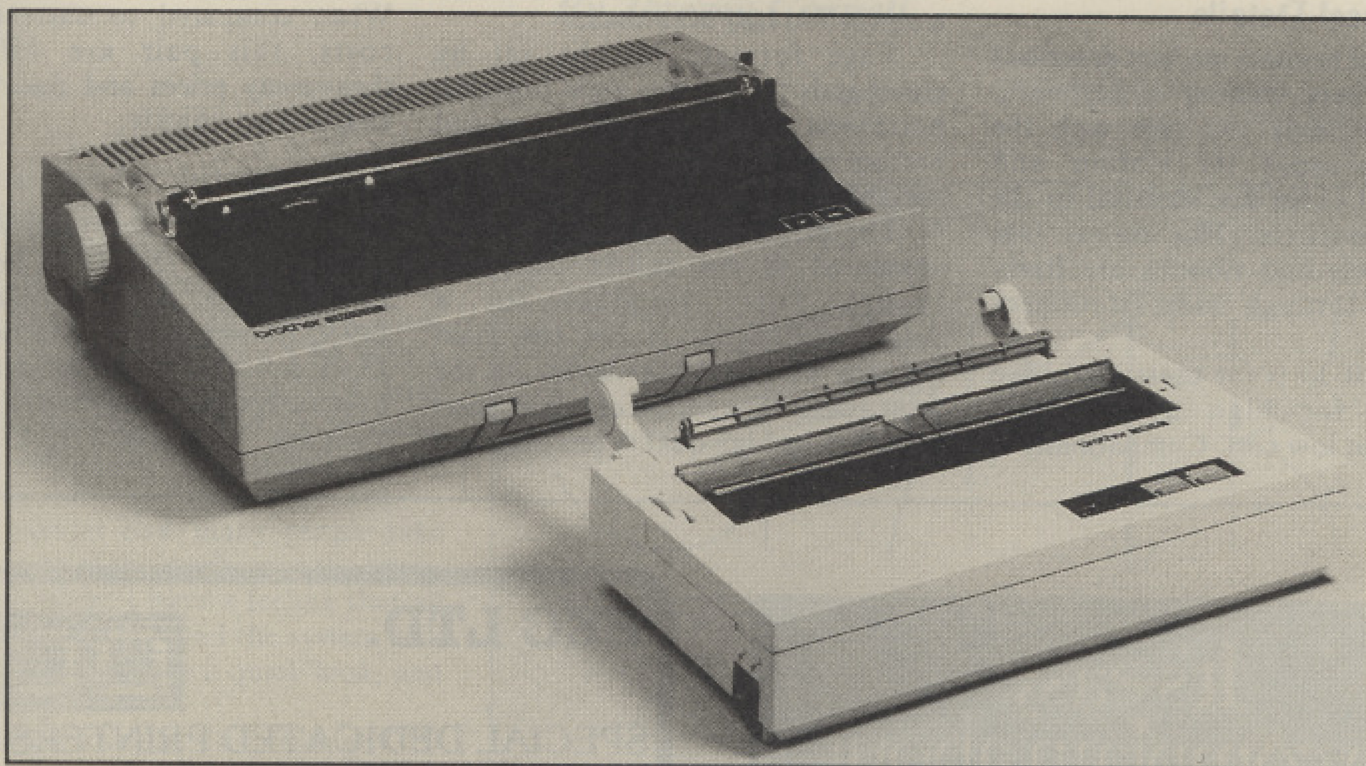
**DTP Comparison Table**

| | Print Shop | Newsroom | Stop Press | GeoPublish |
|---|---|---|---|---|
| Range of facilities | ✒✒ | ✒✒✒ | ✒✒✒✒✒ | ✒✒✒✒✒ |
| WYSIWYG | ✗ | ✓ | ✓ | ✓ |
| Supplied fonts | 8 | 5 | 32 | 8 |
| Clip art | ✓ | ✓ | ✓ | ✓ |
| Kerning | ✗ | ✗ | ✓ | ✗ |
| Text generation | internal | internal | imported | imported |
| Graphic toolbox | ✓ | ✓ | ✓ | ✓ |
| Pixel editing | | | | |
| Menu system | Sub-menus | Icon | WIMP | WIMP |
| Digitised images | ✗ | ✗ | ✓ | ✗ |
| Printers | Dot matrix | Dot matrix | RS232<br>Dot matrix | Laser<br>RS232<br>Dot matrix |
| Ease of use | ✒✒✒ | ✒ | ✒✒✒✒ | ✒✒✒✒✒ |
| Special features | Birthday cards and banners | Modem link | Font designer | Full design display |
| Price | | | | |
| Supplier | | | | |

# Brother

*The HR-5 thermal printer and HR-10 daisywheel are not new machines by any stretch of the imagination but they are tried, tested ... and cheap!*

**By Eric Doyle**



In the office we have a few Brother daisywheel typewriters which get an occasional airing when someone wants to play the role of a hack sweating over a hot keyboard. The presence of these machines was probably the reason for noticing a couple of Brother printers at the last Commodore Show.

The HR-5 is a compact workhorse with a Centronics interface, nine pin matrix head and battery/mains operated. This makes it ideal for those who only make occasional use of a printer and cannot afford to give space to a large machine. When grabbed by the urge to make a printout, the owner of such a machine can take it from the cupboard, shove any reasonable piece of paper over the platten and start printing immediately.

The fact that this has a thermal print-head does not limit the machine to using expensive thermal paper because Brother have included the facility to use a thermal ribbon which produces results on any grade of paper. The manual stipulates that optimum results can only be attained by using glossy finished paper but acceptable results can be achieved with other grades. Even with the coarse jotter paper that I used as a test sheet produced a result which, though not suitable for an impressive business letter, gave a readable printout which would suffice for listings.

The machine has a limited range of features but not to the exclusion of a bit image setting for screen dumps or user-defined character printing. The instruction manual is of little assistance in this mode. Despite the fact that its general quality is good and informative, the bit image section resorts to a form of Japanese English which is more inscrutable than informative. Fortunately, there is enough information to allow a little experimentation which soon clarified the practical side of bit imaging.

Text printing is surprisingly sophisticated for a small printer and follows IBM standard codes which are close enough to Epson standards to make very little difference. I used a standard Epson emulation interface and it worked perfectly well. Reduced, enlarged, elite and pical styles are all included with the ability to combine them to create special effects and to use emphasised print mode to create a higher quality printout which is almost NLQ.

Using subscripts and superscripts poses one or two problems because there is no true facility for these functions. Commands exist to produce super and subscript but the process amounts to a half linefeed. The characters produced are normal size shifted up or down but applying condensed reduced elite characters can overcome this problem to some extent.

The overall shape of the document can be controlled by setting the left and right margins and linefeed distance. The linefeed is essential for graphic mode so that there is no gap between the printed lines. In passing, it's interesting to note that, although

the Epson linefeed standard is based around an eighth of an inch, this machine uses a ninth of an inch but this shouldn't cause any practical problems.

Whether used with thermal paper or a thermal ribbon, the machine runs reliably, though is somewhat slow by current standards. The result is a fairly sophisticated, very quiet, compact machine with a reasonable range of features which suit it to most practical purposes. Don't expect the quality of the latest NLQ dot matrix but don't expect to pay the price of one either.

### Daisywheel Details

Daisywheel printers are best described as typewriters without a keyboard. This is certainly the case with the HR-10 because its ribbon and daisywheel range are identical to the office typewriters. This means that extra wheels and ribbons are freely available through most stationery suppliers.

The HR-10 is for users who have demands for high quality text printouts at low cost. Compatibility is assured with the CBM serial interface included as standard but Commodore graphics are not supported.

The range of daisywheels covers 14 typefaces in various language formats and some have dual pitch capabilities to allow fixed variations of letter spacing.

There is nothing complex about a daisywheel printer but that doesn't mean a total lack of facilities. Characters can be underlined or otherwise emphasised with double strike and shadow modes. There is even a facility for striking through characters with a hyphen as though a correction had been made.

Page formats can be set by commands for left and right margins, horizontal and vertical tabs, top and bottom margins, page length, tabs and variable linefeeds.

The printout speed is slow when compared to dot matrix machines, though fairly standard for a daisywheel. Speed is not the main concern of daisywheel users, its the print quality. The feature of a daisywheel printer is its high quality lettering and this is assured with the Brother's use of standard typewriter parts.

### Conclusions

Both printers performed well under test conditions and at these prices they are both bargains. The thermal printer is especially useful for programmers who want to keep a record of their work whereas the daisywheel is for those who want to produce impressive business letters on a limited budget.

Although both machines are now at the end of their production runs, the use of standard Brother accessories ensures a longer life for the machines. When compared to current printer costs, this pair are offered at throwaway prices and deserve to be snapped up quickly. YC

***Touchline:***
*Brother HR10 Daisywheel Printer £99.95 (tractor feed £9.95 extra) plus £5.05 postage, HR5 Thermal Printer £49.95 (power supply £2.95 extra) plus £3.05 postage.* ***Supplier:*** *UK Home Computers, 82 Churchward Avenue, Swindon, Wilts.* ***Tel:*** *0793 695034.*


It's easy to complain about an advertisement. Once you know how.

One of the ways we keep a check on the advertising that appears in the press, on posters and in the cinema is by responding to consumers' complaints.

Any complaint sent to us is considered carefully and, if there's a case to answer, a full investigation is made.

If you think you've got good reason to complain about an advertisement, send off for a copy of our free leaflet.

It will tell you all you need to know to help us process your complaint as quickly as possible.

**The Advertising Standards Authority.**
**If an advertisement is wrong, we're here to put it right.**
ASA Ltd, Dept 1 Brook House, Torrington Place, London WC1E 7HN

This space is donated in the interests of high standards of advertising.

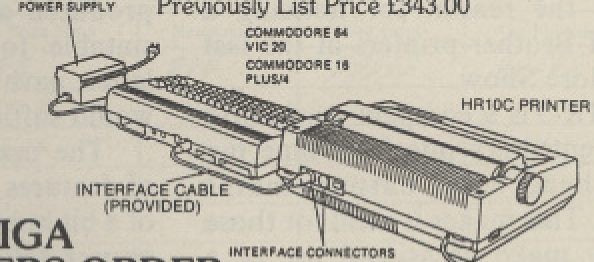


**EEC LTD.**

**SPECIAL DEDICATED PRINTERS FOR COMMODORE USERS**

**★ BROTHER HR10C £120 INC VAT**

Daisy wheel 80 col 12 CPS 2K Buffer, includes TRACTOR FEED - BOOKS IN ENGLISH, GERMAN & FRENCH - CENTRONICS & SERIAL VERSIONS also available.
*IDEAL FOR WORD PROCESSING*
Previously List Price £343.00




**AMIGA USERS ORDER CENTRONICS VERSION.**
**OR HR5 THERMAL 80 COL 30. CPS CAN USE NORMAL PAPER - QUIET PORTABLE BATT OR MAINS £50**
**C64 POWER SUPPLIES £15**

All prices inc. VAT. Add £6 postage for printer, £2 other item. Tel. orders. VISA or cash with order. Ansaphone orders ANYTIME. Please leave telephone number for acknowledgement.

**18-21 Misbourne House, Chiltern Hill, Chalfont St Peter, Bucks, SL9 9UE**
**Tel: 0753 888866**

VISA

# CP/M Lives!

*CP/M, although widely regarded as totally obsolete, offers much to the C128 user. We look at the new kit from Financial Systems Software aimed at getting the most out of your C128's CP/M*

**By Jeremy Cornell**

I've often felt that YC should poll you C128-owning readers, just to see what you get up to with your 128s. After all, the machine does suffer from something of an identity crisis. You can look at it as a C64 with a nice keyboard, a super C64 with double the memory and an adequate Basic, or as a Z80-based micro running CP/M.

I wonder how many people take advantage of the machine in the latter, CP/M mode. I have a feeling that all too many simply load the system disk once or twice, have a quick look, and then forget it.

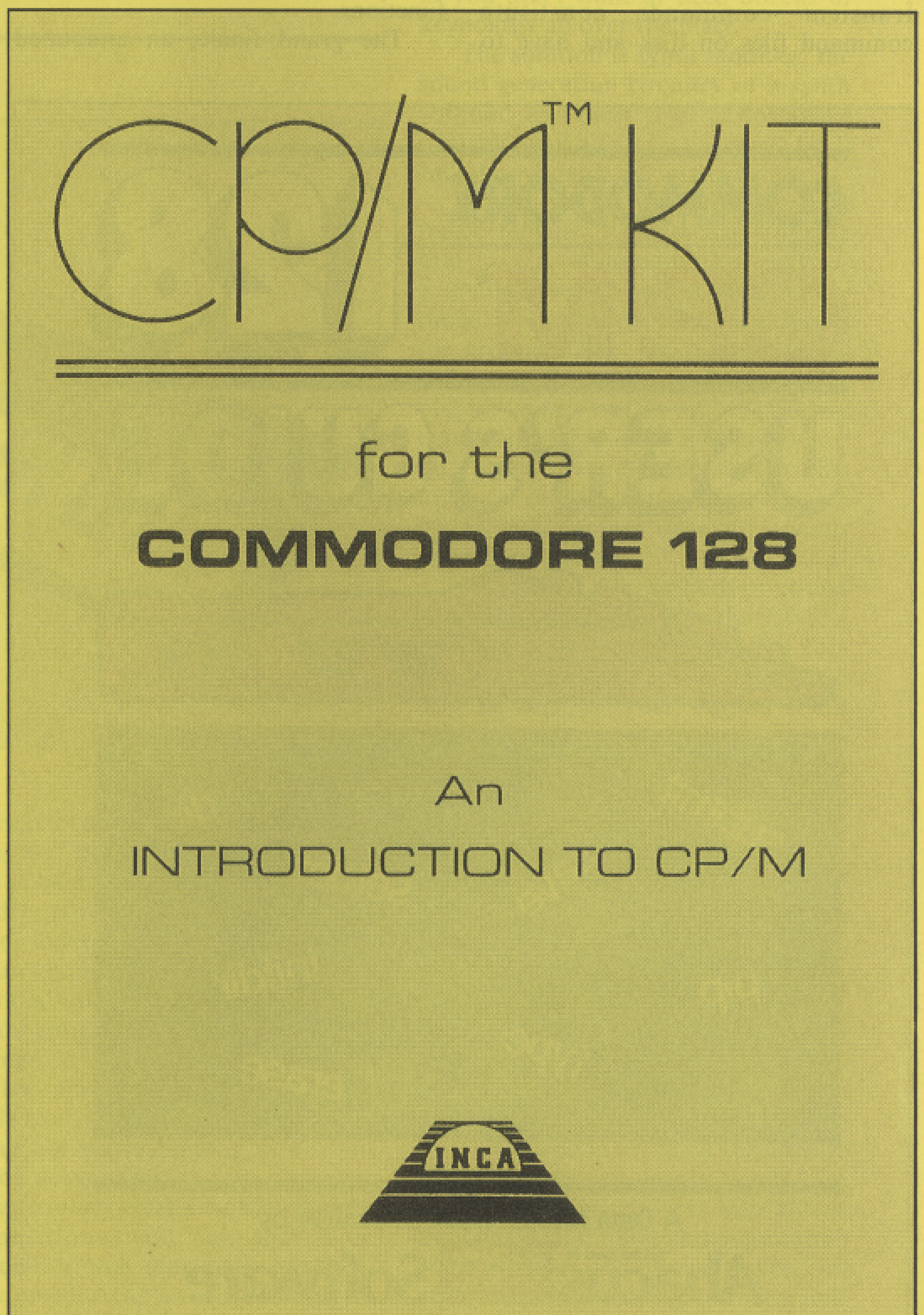
This is a shame, for although CP/M (Control Program for Microprocessors – not a lot of people remember that...) has been superseded in general by MSDOS and its successors, it offers the advantages of a wide range of established software, and as a disk operating system its infinitely superior to the usual Commodore approach with its gobbledygook commands.

The one problem, is that CP/M has become something of a fossil. Quite simply, no-one hacks it anymore. Financial System Software's latest kit may well revive some interest in this venerable operating system.

## Double Pack

The FSS's package is really a bundling of two useful bits of CP/M arcana in one package. One is the Commodore CP/M User's Guide from Abacus, the other is the CP/M kit from Inca, a collection of useful utilities.

Abacus's User's Guide covers a lot of territory. It starts at absolute base level (What is a computer...?) and progresses to levels designed to please the machine-code hacker.



It's not a flashy book, but the layout is very clear. The text forms a very clear progression, so that you can leave off reading at the point at which you feel you don't need to know much more.

For me, it's an excellent reference work. My CP/M's terribly rusty, which is sad, considering I cut my teeth on it.

Even when I had to use the PIP command regularly, I had to look it up most of the time. I wish I'd had this manual at the time – for looking up commands, it's admirably concise.

After an extended introductory section, containing descriptions of the resident commands, the guise goes on to describe the transient commands. For those in need of an explanation, transient commands constitute command files on disk and have to be loaded in, whereas CP/M 3.0 contain the six resident commands DIR, DIRSYS, ERASE, RENAME, TYPE and USER. There used to be only four, but this is CP/M Plus.

Abacus then goes on to discuss many machine-specific details, such as the multi-format capabilities of the 1571 drive. I felt that the guide could have gone into a lot more detail about this, as it's a complex subject, and needs a little explaining.

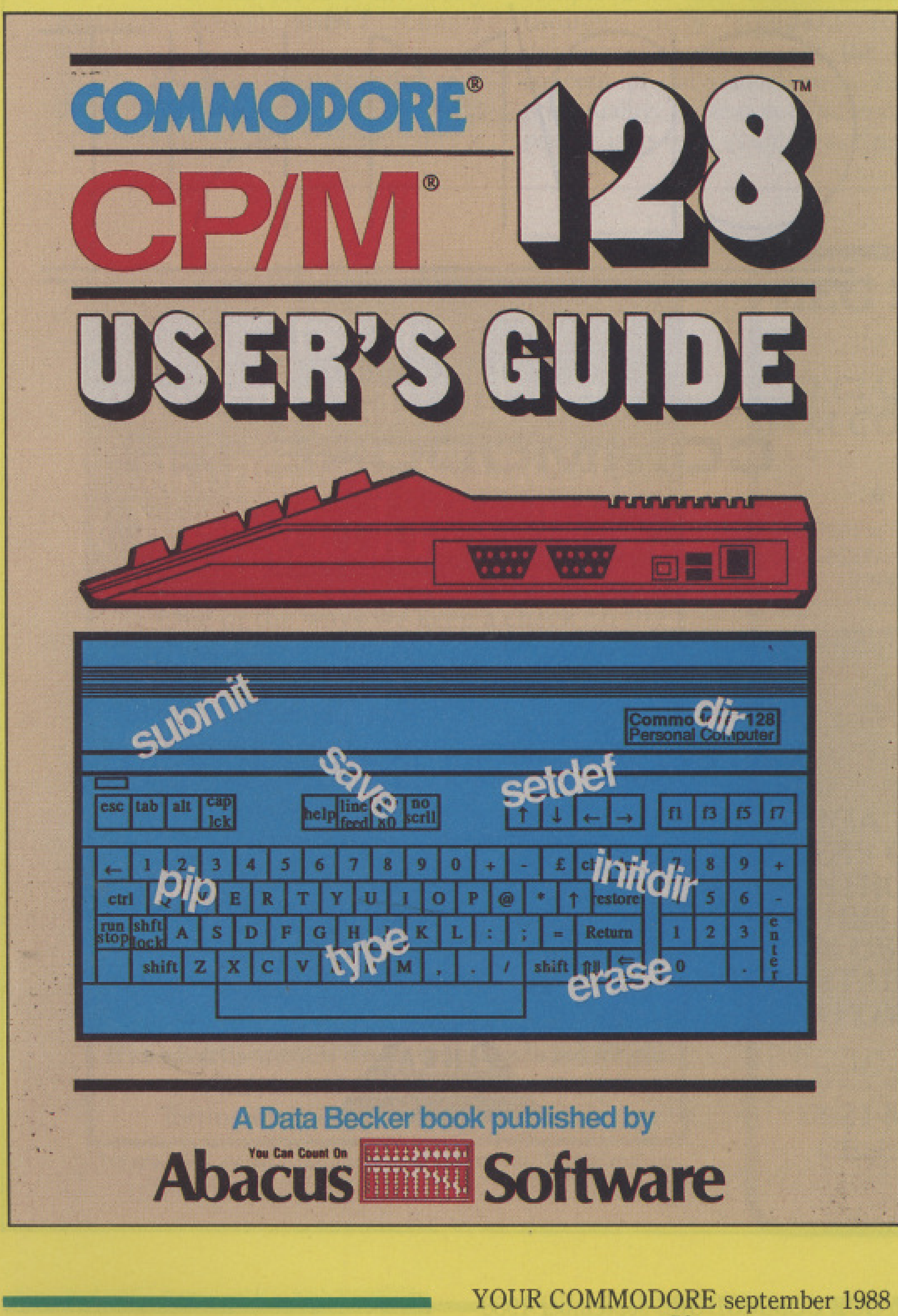
The last half of the manual is the juicy part. If you want to hack CP/M, this is the part for you. You get a good explanation of how to use Digital Research's MAC and RMAC assemblers, successors to the original ASM. This is followed by a worthy account of how to use BDOS functions.

The grand finale, an annotated disassembly of the C128 Z80 Roms, tails things off. All CP/M life is here.

## Kitting Yourself Out

You may or may not find Inca's CP/M kit as useful. The kit contains a range of added CP/M commands. Some of these are better versions of existing CP/M commands, others are complete applications in their own right. Commands include several versions of the DIR command, a very useful patch which will enable you to speed up your 1571, and NEWSWEEP, an advanced disk utility.

The CP/M Kit commands I found to be useful additions to a CP/M repertoire. The applications are rather basic, but could easily serve a useful purpose for the first time CP/M user, who may subsequently go on to better things. CP/M Kit is good value, even if the documentation is a little scanty.




### Summary of CP/M Kit Commands and Applications

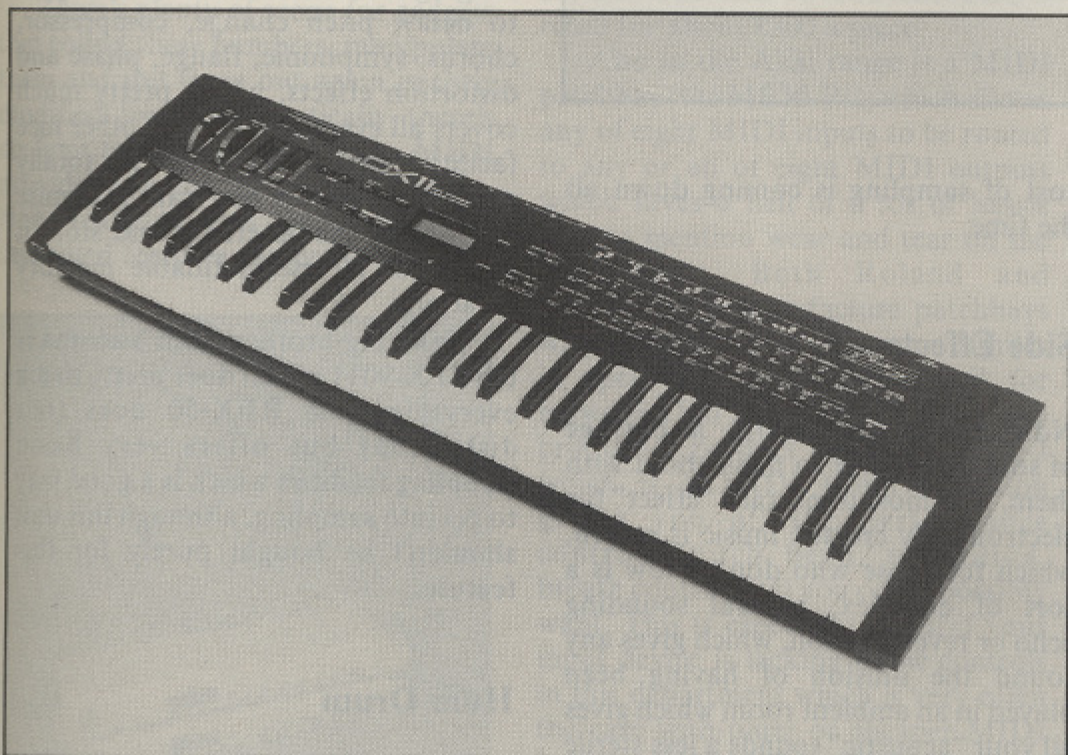
| | |
|---|---|
| C1571: | Speeds up the disk drive |
| CONF: | Sets up system parameters |
| DD: | Quick directory listing |
| DE-LBR: | Separates libraries into their individual files |
| EDFILE: | An alternative line editor to ED |
| LDIR: | Gives a directory of a library |
| LRUN: | Allows programs to be loaded and run while still inside a library |
| LTYPE: | Displays any ASCII file on the screen, squeezed or not |
| MCAT43: | Disk cataloguing program |
| MEX128: | CP/M terminal program |
| NEWSWEEP: | Comprehensive disk utility |
| NEWSYS: | Updates CP/M systems |
| NULU12: | Library file utility |
| SCAN12: | View documentation files backwards and forwards |
| SD-50: | Quick directory |
| SQ: | Produces compressed (squeezed) files |
| USQ: | Unsqueeze files |
| VED13: | Wordprocessor |
| XCAT40: | Produces disk or paper copies of directories |
| ZCHESS: | Chess |

***Touchline: Supplier:** Financial Systems Software, 18 High Street, Pershore, Worcester WR10 1BG **Tel:** 0386 553153 **Price:** £34.95*

# Beyond the Sequencer

*Turn a nice ditty into a glorious production*

***By Darrin Williamson***



We've all seen what can be done with a Commodore and the right software. Compositions can be entered, altered and output to a series of musical instruments. However by incorporating certain hardware and software, the skys the limit, as to what you can produce!

The first area for improvement would be your sound sources. Most people tend to start off with a single keyboard which is only capable of generating one sound at a time. So all the different parts you have programmed in (i.e. Bassline, chords, etc) will come out in one voice which will sound boring to say the least.

Even if your set-up allows different voices for different parts the whole piece is likely to sound very synthetic and dry, not through any fault of the user or indeed the piece of music, but because the sounds used are artificially generated and never actually exist as sounds until after the piece has been recorded.

This may not seem like a big problem at first and for many users it may not prove limiting at all, but as soon as you begin to take computer music seriously you'll find that straight compusitions will lack that slick production that our ears are now accustomed. At this stage you may be forgiven for thinking that what was a nice little hobby is now in danger of turning into a multi-million pound venture.

Fear not! Thanks to the modular magic of MIDI you can produce some very professional sounding compusitions on a relatively small budget. All you need is a few little black boxes and a handful of 5-pin DIN leads (Squeezy bottles, sticky-back plastic?) Allow me to explain...

## Sounds Around

Until recently there was only solution to the problem of having enough sounds to make your music work. This was the space and money consuming process of buying additional keyboards. This is rather impractical as you don't want or need dozens of keyboards all over the place.

The solution is synth modules; the sound generation circuitry of a synth without keyboard and performance controls which can be triggered via a MIDI keyboard and/or sequencer.

Not surprisingly it's the Japanese music moguls, Roland and Yamaha that so far dominate this market. Yamaha have two budget units in their range. The first is the FB-01 which sells for around £200. This unit provides some very nice sounds and at the price of £199 works out as a cost effective expander. The unit is eight voice polyphonic which allows (in this instance) you to play one sound with up to eight voices or eight sounds monophonically.

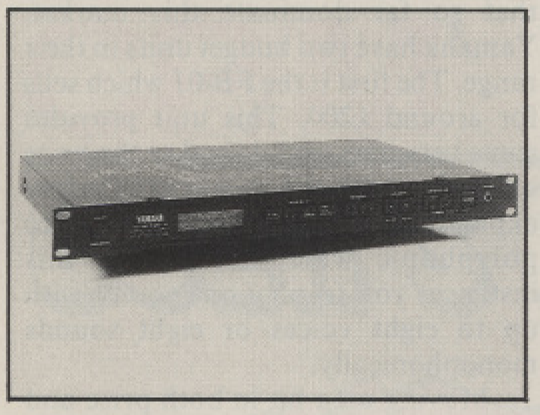
Moving on a bit in both price and flexibility we find the Yamaha TX-81Z retailing for about £400. This unit does feature programmability and is housed in a 1U high 19″ rack mounted unit (the industry standard for studios). This unit does sound nicer than the FB-01 and is more flexible in that performance patches can be created which allow you to define how many sounds you want, what they are, how many voices you want to assign to each (maximum of eight again), and so on. A great improvement on the FB-01, but still requires a degree of forward planning in sorting out what sounds are likely to take up what voices.

Roland have come to the rescue on this point with the MT-32 which costs £450 and is designed specifically with the sequencer user in mind. Like the Yamaha models, this also allows eight different timbres at the same time but is 32 voice polyphonic so you can quite happily run all eight timbres and play each polyphonically. Further-

more the MT-32 has a built-in digital reverb and the 30 PCM percussion sounds from the latest Roland drum machine the TR-626 so you can allot one of your sequencer tracks to playing purely the drum part and save yourself the cost of a drum machine.

Just released from Roland is the D-110 which is very similar to the MT-32 in many respects. However the D-110 has separate audio outputs which is a very useful feature if you intend to hook the unit up to a reasonable mixer and allows you to program in your own sounds without software assistance.

All the above units have 128 sounds and in general consist of imitations of orchestral sounds (strings, brass, bass, piano, etc) although all units offer some very nice, distinctive sounds of their own. So which has the best sounds? Well there is no simple answers, it's really just a question of listening to all of them for yourself, although my personal favourite is the MT-32.



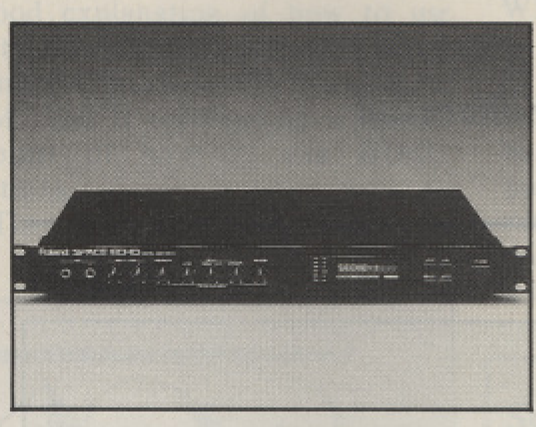
## Sampling Delights

Sounds Sampling differs from synthesis in that with sampling you "record" a sound by coverting it into numbers and then playing back the numbers, converting them back into sound. There are several packages that work on the 64 which act as a good introduction to the process, most notably the Microvox.

However, for musical applications, far more sophisticated units are required which, again are MIDI driven. A samplers main use is to copy the sound of an acoustic instrument, for instance piano or drums. This use of sampling is so widespread that about this time last year Phil Collins estimated that his drum sounds had been pillaged and used on seven of the songs in the Top Ten that week.

Samplers aren't just used as Audio Robin Hoods though. Many bands use them to capture the sound of something that is not normally considered musical and making it so. Many of the Hi-Tech indie bands such as Depeche Mode and Erasure will have samples of tin trays, milk bottles, buckets, etc on their records.

The Akai S900 and the Roland S-50 have the lions share of this market although both machines retail for around £1500. Not to worry though, both manufacturers have produced models under the £1000 mark, and the



cost of sampling is coming down all the time.

## Side Effects

Now you've sorted out a barrage of sounds it's time to mess about with them. The most important "effect" for electronically created music is reverb, which for those who don't know is a sort of complex, natural sounding echo or reverberation, which gives any sound the illusion of having been played in an ambient room which gives all your "acoustic" sounds a less sterile feel.

Just recently we have seen a revolution in Digital Reverb. Prices have just kept falling and falling to the point where you can now get a reasonable selection of reverb treatments (short, long, gated and reverse) for about £150. However the added advantages of MIDI do add something like £50 to the price of a unit.

Alesis (distributed in this country by Sound Technology) have pretty much cornered the budget reverb market with the Midiverb which was released a couple of years ago. This model has 64 presets (which is enough for most people) and all of these can be called up by a MIDI patch change. In other words you can transmit a program change from your input device which changes the reverb treatment. Since its launch the Midiverb has been superseded by the Midiverb II which gives you 99 presets. Not just straight reverb effects but variations on a theme like echo, flange phase, etc. The Midiverb II costs £299.

Simulating a room, however is just one treatment you can give a sound. There are all manner of different ways of squashing, stretching and delaying sounds to make them more interesting. Several manufacturers produce units that store all the effects that you're likely to need in one convenient box. Most of these units are now MIDI controlled which again, allows patch changing. Many of these effect units also allow MIDI triggering of effects where audio triggering proves too slow to be useful.

Yamaha lead the way here with the REX-50. This has 30 preset effects ranging from reverbs of various types to delay, pitch change, compressor, chorus, symphonic, flange, phase and distortion effects, which pretty much covers all eventualities. The other nice facility is that all the effects are totally programmable so you can customise any one of the 30 effects and store it in one of 60 user-definable memory locations.

Rex's big brother from Yamaha is the SPX-9011 which does pretty much everything the REX-50 does (bar distortion) but offers very basic sampling facilities which is a good way to get into sampling, although this unit shouldn't be bought purely for this feature.

## Hum Drum

Percussion is an important aspect of most forms of music nowadays. Dedicated sound packages exist for the 64 but a much better way of tackling the problem is to use a Drum Machine which gives your finished compusition, better quality and a better variety of drum sounds. Most sequencer packages will give you the option of syncronising a beat box to it. So, effectively the sequencer will take its timing from the Rhythm track (just like in real life!). This will also give you the benefit of having spare sequencer memory for your tune. There are literally dozens of different drum machines for the budget-minded. Roland TR-626, Alesis HT-16, and the Yamaha RX11 are just a few of the units on offer. All of these

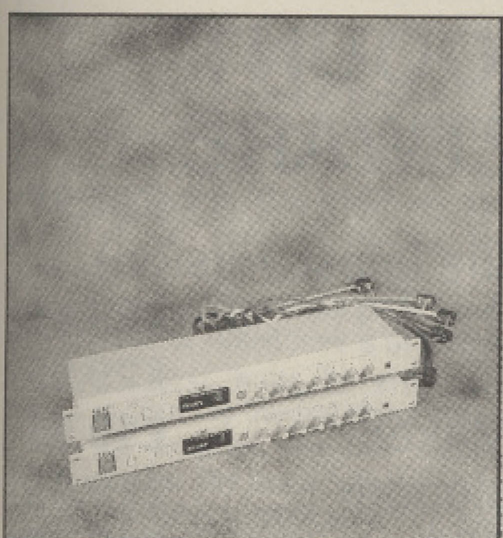
feature sampled drum voices and have both real time and step time programming modes. Some models will allow you to enter the drum voices from a MIDI keyboard which may well give the added advantage of touch sensitivity which can really make a drum pattern come to life.

Cheetah Marketing have gone one step further and added a set of five dedicated drum pads to their digital drum machine. The total package price for these two units is £300 (£140 for the MD8 drum machine, £160 for DP5 drum pads).

## MIDI Manipulation

That's just the start of what you can do with MIDI, as it's just numbers being pushed through a serial comms port.

There's plenty of scope for gadgets that collect these numbers, manipulate them and spit them out again in their modified form. Theoretically there's no limit to what you can do to MIDI provided you have the right hardware. New features can be added and unwanted features can be filtered out.



*Akai have produced two wonderful units; the MB-76 gives you the ability to set volume levels of various instruments which can be stored and called up as MIDI patch numbers. The other does the same kind of thing with tone (or equalisation) settings.

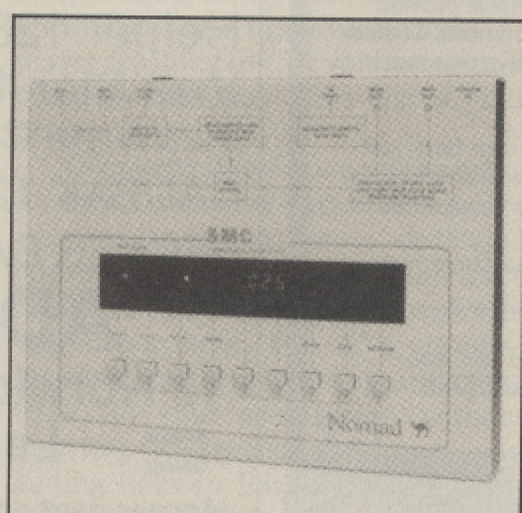
The PEQ-6 behaves pretty much like six graphic equalisers which, again can be set, stored and recalled via MIDI. The combination of these two units gives the user, in effect a spare pair of hands which would normally be needed on a mixing desk of some kind. You also have the added advantage of speed as MIDI can do things much quicker than the likes of us.

In conjunction with a sequencer these units are of great use in a number of ways. Firstly the Mix Bay can be used to mute instruments that are not needed for both verse and chorus. You can also vary the volume levels within pieces (gradually bringing up the volume of an instrument to achieve a "big finish" to the song). The PEQ-6 can also do some magical things particularly if you're swapping instruments around a lot in apiece.

Each set of instruments can have their own set of tone treatments which can be called up at the same time as the sounds themselves. All that is required is leaving a sequencer track spare just to put patch changes on which will drive units like this as well as all the effect units I mentioned earlier. The MB-76 and the PEQ-6 retail for about £300 a piece.

Also in the Akai range is a MIDI patchbay (the ME30-PII) which allows any of eight MIDI inputs to be routed to any or all of eight MIDI outputs which saves a hell of a lot of hassle (not to mention wear and tear on the equipment). Both Roland and Yamaha also manufacture patchbays which appear to be somewhat similar in spec. All three units retail for between £100 and £200. Yamaha also produce a product called an MCS-2 which is a MIDI Control Station giving you all the performance controls (pitch bend, modultion, breath control, etc) you could possibly want. This is especially useful if your input device is lacking a few controls in this department which is very often the case with older or cheaper MIDI keyboards.

Hertfordshire based company Nomad have brought to these shores two pretty nifty little gadgets for the MIDIphile. The first is an audio to MIDI trigger interface which converts, say a drum beat into a MIDI code so if a friend of yours insists on playing live drums you can take the audio signal and convert it into a stream of MIDI codes which could be fed into your drum machine.




The P2M costs about £150. Also in the range is the SMC 1.0 which converts MIDI codes into SMPTE (Society of Motion Picture and Television Engineers) codes which allow very accurate synchronisation to a tape machine which is extremely useful if you intend to link your sequencer to a multi-track recorder at some stage.

As you can see, MIDI opens up a whole wealth of possibilities to both professional musicians and the home enthusiasts. Contrary to what some "real musicians" may say, MIDI isn't just a cop out for people with no musical talent but a means of extracting what talen in the individual and exploring it to the full. YC

***Touchlines:***

***Akai (UK) Ltd,*** *Haslemere/Heathrow Estate, Silver Jubilee Way, Hownslow Middx.* ***Tel:*** *01-897 2487*

***Alesis,*** *Sound Technology PLC, 6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR.* ***Tel:*** *0462 480000.*

***Casio UK Ltd,*** *Unit 6 1000 North Circular Road, London NW2 7JD.* ***Tel:*** *01-450 9131.*

***Cheetah Marketing Ltd,*** *Norbury House, Horbury Road, Fairwater, Cardiff CF5 3AS.* ***Tel:*** *0222 555525.*

***Nomad Ltd,*** *North Road Farm, North Road, Wendy, Nr Royston, Herts SG8 0AB.* ***Tel:*** *0223 207770.*

***Roland (UK) Ltd,*** *983 Great West Road, Brentford, Middx.* ***Tel:*** *01-568 4578.*

***Yamaha-Kemble,*** *Mount Avenue, Bletchley, Milton Keynes MK1 1JE.* ***Tel:*** *0908 71771.*

# I·C·P·U·G

the Independent Commodore Products Users Group is the largest and most friendly computer club in the country

*Back issues for 1987 available to non-members as well as members, at £1.50 each, postage paid.*

- **Many local groups with regular meetings**
- **News magazine included in membership - 100 plus pages of reviews, news and information every two months.**
- **We support all Commodore Machines old and new; PET, VIC20, 64,16, +4, PC, 128 and all AMIGAS.**
- **Free Software Library of public domain programs for all the above machines available to members on supply of blank disk or tape and payment of p&p. New members, do not send for this until membership number is received.**
- **Help and Advice**
- **Discount scheme**
- **Subscription only £10 per year (UK) plus £1 joining fee**

If you are seriously interested in using or programming any Commodore computer, then joining ICPUG is a must!

For full details, send a stamped, addressed envelope to:

**ICPUG Membership Secretary, Jack C. Cohen, 30, Brancaster Road, Newbury Park, Ilford, Essex, IG2 7EP**

# POOLSWINNER II

THE ULTIMATE POOLS PREDICTION PROGRAM




- **MASSIVE DATABASE** Poolswinner is a sophisticated Pools prediction aid. It comes complete with the largest database available – 22000 matches over 10 years.
- **PREDICTS** Not just SCOREDRAWS, but AWAYS, HOMES and NO SCORES.
- **SUCCESSFUL** SELEC guarantee that Poolswinner performs significantly better than chance.
- **ADAPTABLE** Probabilities are given on every fixture – choose as many selections as you need for your bet. The precise prediction formula can be set by the user – you can develop and test your own unique method.
- **SIMPLE DATA ENTRY** All team names are in the program. Simply type in the reference numbers from the screen. Or use FIXGEN to produce fixture list automatically (see below).
- **LEAGUE AND NON-LEAGUE** All English and Scottish League teams are supported, and also the non-league sides often used on pools coupons.
- **PRINTER SUPPORT** Full hard copy printout of data if you have a printer.

**PRICE £18.00 (all inclusive)**

NOW AVAILABLE

## FIXGEN 88/9

AT LAST: No more struggling for hours to get the fixture list into the computer. FIXGEN has been programmed with all English and Scottish League fixtures for 1988/89. Simply type in the date, and the full fixture list is generated in seconds. Fully compatible with Poolswinner. Yearly updates available.

**POOLSWINNER with FIXGEN £19.50 (for both)**

## COURSEWINNER V3




**THE PUNTERS COMPUTER PROGRAM**

**NOT JUST A TIPSTER PROGRAM,** Coursewinner V3 can be used by experts and occasional punters alike. You can develop and test your own unique winning system by adjusting the analysis formula, or use the program in simple mode. Coursewinner V3 uses statistical analysis of major factors including past form, speed ratings, course statistics, prize money, weight, going, trainer and jockey form etc, etc. It outputs most likely winners, good long odds bets, forecasts, tricasts etc. The database includes vital course statistics for all British courses. You can update the database – never goes out of date. *FULL PRINTER SUPPORT.*

**PRICE £18.00 (all inclusive)** includes Flat AND National Hunt versions.

**AVAILABLE FOR** All supplied on tape ... (Automatic Conversion to disc) AMSTRAD CPCs, BBCs, COMMODORE 64/128, SPECTRUM

**DISCS ... (Add £3.00)** AMSTRAD PCW, IBM Format, COMMODORE AMIGA, ATARI ST

Send Cheques/POs for return of post service to . . .

**selec** SOFTWARE

phone 24 hrs

62 ALTRINCHAM RD, GATLEY, CHEADLE, CHESHIRE SK8 4DP. ☎ 061-428 7425

(Send for full list of our software)

# TELETEXT

A world of information at your fingertips




Teletext on your 64 or 128 brings you the very latest information free! And unlike a Teletext TV you can print pages like todays TV or save a recipe to disc or cassette. Ceefax and Oracle provide hundreds of pages of news, sports results or share prices, weather and road reports, cars for sale, even bargain holidays plus much much more.

The Microtext Teletext Adaptor fits neatly on the user port, just connect it to the Tuner and plug in an aerial or the Adaptor alone may be connected to the VIDEO OUT socket of a video recorder.

The Microtext Adaptor is only £79.85, Adaptor and Tuner just £124.95 including VAT and p/p.

**AMIGA**

Amazing full feature Amiga version speaks etc. etc. and also provides colour TV on your monitor. Available now £124.80 + VAT.

# MICROTEXT

Dept. YC, 7 Birdlip Close, Horndean, Hants PO8 9PW
Telephone: (0705) 595694

# DISCOUNT SOFTWARE

| | |
|---|---|
| Fontmaster | £34.95 |
| (This is the latest version) | |
| Toyshop | £39.95 |
| Printshop | £29.95 |
| Certificate Maker | £19.95 |
| Create A Calender | £19.95 |
| Hack Pack 128 | £12.95 |
| Petspeed | £12.95 |
| Helper 128 | £14.95 |
| Viza Star 128 | £74.95 |
| VizaWrite Classic | £54.95 |
| CADPAK 128/64 | £29.95 |
| BECKER BASIC | £29.95 |

# ADAMSOFT

**18 Norwich Avenue, Rochdale, Lancs. OL11 5JZ**

***Access card orders accepted - Tel. 0706 - 524304***

# Making Music

*Continuing our music series, this month we look at creating and using soundtracks*

***By Peter Gerrard***

The first rule to observe when creating musical soundtracks seems to be to make it as long as possible! I've seen a number of cassette inlay cards and game instructions boasting about the fact that the game contains "a ten minute musical soundtrack by Frieda Villain", or words to that effect. Creating such a length of music is no great hardship, and the routine in this section will take up none of the available Basic RAM from the Commodore 64. Indeed, there is nothing to stop you having one soundtrack playing while, say, the player of the game is reading the instructions, and then loading in another one with the main game itself. The point to be noted here is of course that the player must be given the option to turn the blessed thing off.

In the program for this section you'll see that the main 'tune' is held in memory from $C000 to $C7FF and the repeating 'riff' lives from $C800 to $C8FF. There is no real reason why this cannot be made longer, if you want to experiment, but I think that 256 notes for a repeating riff and 2048 notes for the main tune is long enough, and provided that you don't get too carried away and don't play more than about three and a half, four notes per second, you'll easily achieve your ten minute soundtrack. You can of course, play at a fraction of that speed and have a half hour musical interlude if you want, but however good the game might be this could possibly induce severe boredom on the part of the player.

The second rule to observe is to be harmonious. When starting to compose your first soundtracks, try and think in terms of simple tunes and don't attempt to create a magnum opus all in one go. Think of simple note sequences. The classical C, F, C, G, F and back to C again, for instance, might be a reasonable sequence for the repeating riff, perhaps playing some sixteen or so notes in each key. For example, assuming each note to be played at the same speed, then:

C, E, G, A, C, A, G, E

and then repeated gives a fairly familiar little boogie style of playing, and if this can then be moved up to the key of F, back to C, on to G and back to F again before it starts to repeat, this gives the main tune something to work its way around.

If possible, keep the repeating riff to a fairly low octave, letting the main tune ride over it and play at a much higher one. I've found this a reasonably simple way of writing a long running background tune, and it's a way that doesn't necessarily have the player reaching for the volume control every time he encounters one of your programs.

Of course, this is not going to make it easy to transpose one of the classics to your computer, more dedicated commercially available software packages can make life a lot easier in that department, but as a straight-forward way of producing a backing track for your own games, without resorting to special commands and adding links to Basic or whatever, it manages to suffice quite nicely.

Having got the background riff going, you can then concentrate on the main tune itself. A sequence of 16 notes played out eight times gives us a total of 128 notes before that sequence starts to repeat itself. This is only using half of the available notes, but it will do to get us started. Bear the number of 128 in mind, because if your main tune doesn't in some way adhere to this number, things can start to become terribly discordant. Every 128 notes or so you're probably going to have to either revert to something starting in the key of C, or something that harmonies well with C, unless you want to go into electronic wizardry and start introducing ring modulation and synchronisation, perhaps changing the filtering of a note as it passes through the ADSR sequence of its life.

This can produce some wonderful sounds, so find out where the waveforms are stored in memory (just hunt through the loader program to find a sequence of numbers like 141,11,212 to indicate voice 2, or 141,18,212 for voice three) and change the waveform immediately before that. This waveform will be a 17, a 33, a 65 or a 129 in this basic example, since no attempt has been made to cater for ring modulation or synchronisation.

To change the filter as a note is being played is slightly more complicated, but we've already seen which registers to alter to do this, and so a small amount of code will have to be inserted immediately after playing one note and before playing another, so that the effects of the changing filter can clearly be heard.

By playing through the main tune once, and then altering the ring modulation settings, or synchronisation, or changing the filters, your ten minute soundtrack can indeed be made to go on for half an hour or more without starting to repeat itself. In theory it could go on indefinitely, I suppose, but that's up to you to experiment with!

## Program Changes

On to the program itself. We've seen where the notes are stored in memory, and you may have been puzzled as to why I said that $C800 to $C8FF gives us the space to store 256 notes, since there are only 256 bytes available in that particular amount of memory. No, we haven't gone back to just using the frequency, and in any case most of those cover two byte numbers anyway; the low and high value frequencies in fact.

No, we're relying on the fact that most tunes do not expand over more than about three octaves, and are using some 31 notes in all. A separate table reads a number from the data in $C800 to $C8FF and converts that into the high/low values of the frequency. Say it comes across a number 27. The 27th entry in our table will tell us perhaps that note 27 corresponds to a high value of 31 and a low value of 165. These values are then POKEd into the correct registers (or, strictly speaking, the value held in the accumulator is stored in the correct registers) and the right note is then played.

In Basic terms, it might look something like this:

```
1000 DATA 2,24,2,56,2,90,2,
125,2,163,2,204,2,246.
```

If you, look at your manual you'll see that this corresponds to the high/low frequencies for all the notes from C-1 to F -1. Obviously, you'd have more data than that in our program to cover all 31 notes. Then, another set of data contains the notes to be played:

```
100 DATA 1,3,5,6,5,3,1
```

The first note has the high/low frequencies of 2,24 (as read in from the table), the third one has the high/low frequencies of 2,90, and so on. Thus by just using these 31 notes we can effectively halve the amount of memory required to store a long tune and use the spare RAM from $C000 to $CFFF into the bargain, leaving us with a very long tune that takes up no amount of memory at all.

As with the ordinary musical soundtrack program I used the synthesiser program, slightly modified, to POKE numbers in the range 0 to 31 into memory, the precise area of memory ($C000-$C7FF or $C800-$C8FF) depending on which voice I was altering at the time. Play a note, determine which one it is in our sequence of notes from 0 to 31, and put the number in that range of 0 to 31 into memory.

Filters, ring modulation and synchronisation are up to you: the basics of the program are there to be played with and modified. It's the only way to learn, believe me!

Next time, we'll look at a slightly technical roundup of the SID chips capabilities. It all helps in understanding how the thing works! YC


TRYING TO USE YOUR COMPUTER?...

YOUR COMMODORE CAN HELP.




12 issues UK £13.20
12 issues Europe £20.90
12 issues Middle East £21.20
12 issues Far East £24.00
12 issues Rest of World £21.60

Please begin my subscription(s) to YOUR COMMODORE with the ............ issue.
I enclose my cheque/money order for £ ............ made payable to Argus Specialist Publications Ltd.
or debit £ ............ from my Access/Barclaycard No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
valid from ............ to ............
NAME (Mr/Mrs/Miss) ............
ADDRESS ............
............
Postcode ............
Signature ............
Date ............

Please use BLOCK CAPITALS and include post codes

Send this form with your remittance to:
*INFONET LTD., 5, River Park Estate, Berkhamsted, Herts HP4 1HL*

# Howdy Partner 128

*A quick notepad utility cartridge for the busy executive*

By Norman Doyle

Apart from making disk backup systems, British cartridge manufacturers seem to be devoid of ideas. Apparently, this isn't true of our colonial cousins in the States if Partner 128 is anything to go by.

Contained within the little black box is a desk diary, calculator, memo pad and address book with a C128 disk turbo, all on ROM supported by a small RAM chip. This may not seem very revolutionary because there are many software programs, like Database's Mini Office II, which do similar things but Partner can be used in conjunction while another program is running in the computer's memory.

The cartridge sits quietly in the rear of the computer with a jump lead in Port 2. By pressing the reset button on top of the cartridge, the current program is interrupted and Partner's menu window indicates that it is ready to use. When the utility has been used, Partner's control is released by pressing the ESC button and, like magic, the original program appears and continues from where it was interrupted.

The only disadvantage of the cartridge is that it cannot access tape. This is because two assumptions are made: that the user is a rich American who would have a drive anyway, and that no-one can live without a disk drive for a C128.

## The Options

The first option on the Partner menu brings up the appointments diary. A calendar is presented which displays one month per page from January 1986 to December 1999. Cynics may think that this utility has obsolescence built in but the C128 will have long disappeared by 1999 – except for those which have been lovingly maintained as museum pieces.

Selection of the current month is achieved by skipping through the calendar in six month chunks until the approximate position is reached. Then, by advancing or retreating through the calendar entries month by month, the current page can be found and the acutal day can be selected.

Pressing return when the cursor is on the actual date flips the calendar into the appointments page. There are four boxes for data, the first one of which permits a ten character label to be entered for display, after the rest of the appointment's boxes have been completed. These boxes are for key tasks,, things to do and time-labelled appointments for that day. Not all boxes have to be filled and then, on returning to the calendar, the date entry has been changed to display the ten character label which was entered earlier. The appointments diary must now be saved to disk before entering the other facilities.

Saving data before each function change is advisable because the cartridge has limited RAM which is also accessed by utilities such as the address book and memo pad. Similarly, any saved data can be rapidly recalled by loading back in from disk. To help with loading, the disk directory can be viewed to enable datafile selection. Of course, all of this means that a disk must be kept alongside the Partner, preferably with a backup locked away somewhere safe.

The memo feature is a simple notepad/wordprocessor which can be used for quickly scribbled reminders to yourself or even to print out short letters and internal memos. Another function can be as a Help screen for other programs. Plug in Partner, load the program and then press the reset button. A previously prepared help disk can then be loaded and displayed to show user-defined functions within the resident program or simply to show its standard features.

The memo page can also be used to turn the C128 and printer into a limited-memory typewriter. With the typewriter function on, anything typed onto the keyboard will be directed to the printer when the return key is pressed.

Modem users will find the address book a boon. Not only can names, addresses and phone numbers be entered but autodial modems can also

be given the relevant number to call by the press of a key. Sadly this database uses American titles for the fields within the address base but I managed to cope without too much trouble. The only real probelm is encountered when an address is too long – ironically, Commodore's address came into this category.

The full database can be listed to a printer, address labels created or a phone list generated from the in-built data processor. The distance between labels can also be set but this is done from the setup option which we'll be meeting later.

Wordprocessors usually have fairly basic calculator functions, if they can calculate at all. With Partner a full desktop adding machine is provided so that a printed record of the calculations can be kept for future reference. The printer can also be used to get a dump of the current C128 program screen, but only if text alone is displayed – if the screen uses high resolution or user-defined graphics, forget it.

Disk commands can be sent to the drive for all of the DOS features but for me the most interesting feature of this section is the printer command line. Some older wordprocessors are unable to support some of the latest printer features. This facility over-rides the program in the computer's memory so that commands can be sent to set up alternative typefaces and other specialised facilities.

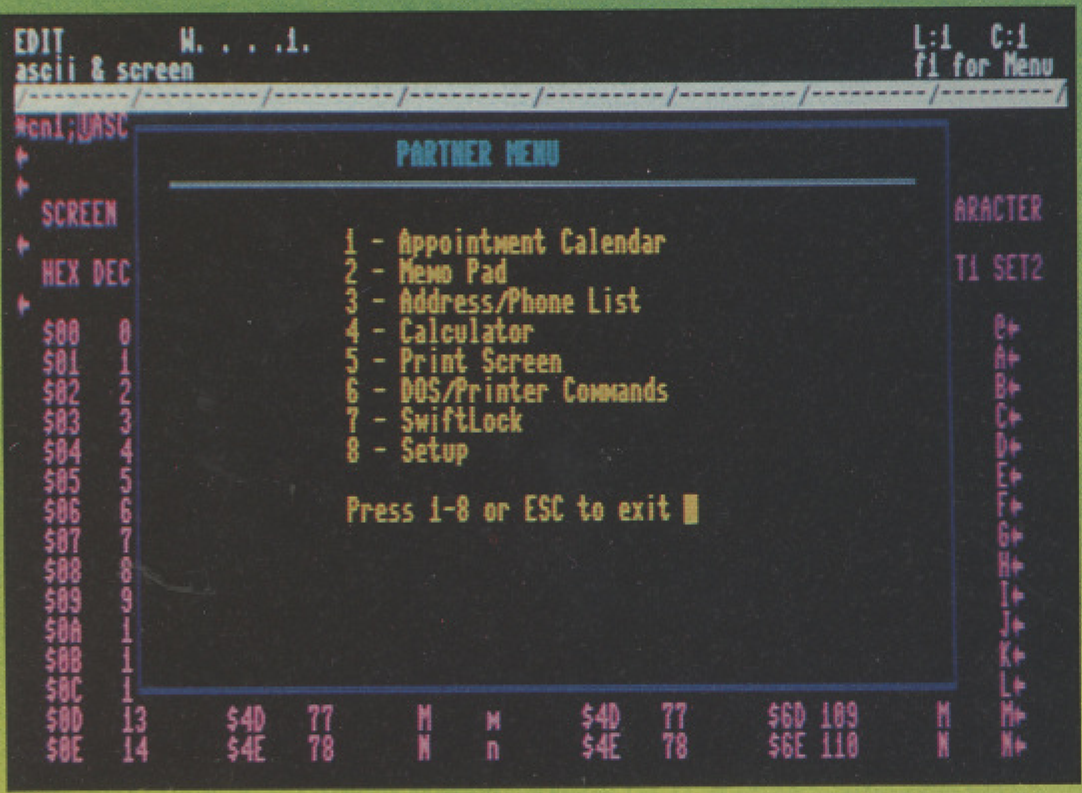



If you work in a busy office you'll appreciate this next feature. Before leaving Partner a five letter code can be entered which locks up the keyboard. This means that it is safe to leave a program running because no-one will be able to use the keyboard until the password is entered. If you're called away by a friend or by nature, the program is tamper proofed. Unfortunately, this feature does not protect against the power switch!

The final option allows protocol codes to be set for printers, disk drives and modems. Label spacing is set here, along with the secondary printer address, and ASCII or CBM character code selection.

According to the manual, the standard facilities can be supplemented by adding self-penned, machine code routines which can be stored in the cartridge RAM. The technique is a closely guarded secret and a certain amount of money will have to change hands before Timescape will reveal all.

I'm currently using Partner in conjunction with SuperScript 128 and found to my chagrin that disk access is inhibited because the wordprocessor leaves an open channel to the disk drive. A search through the informative manual revealed that pressing the CBM key and letter 'O' at the same time would clear the channel, but could possibly cause problems when leaving Partner. Being brave, I tried it, the disk was freed and no ill effects were created when returning to the program. This is indicative of the care with which Partner has been implemented and it is highly recommended for use by the busy executive, or anyone else for that matter.




***Touchline:***

***Producer:*** *Timescape.* ***Supplier:*** *Financial Systems Software, 18 High Street Pershore, Worcs Wr10 1BG.* ***Tel:*** *0386 553153.* ***Price:*** *£49.95*

# Listings

*Get it right first time with our deluxe program system for the C64.*

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. Fret no more, it's all part of our easy entry aid.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA10] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:

[CTRL N, DOWN2,LEFT5,BLUE, F3,C3]

This would be achieved by holding down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2 would of course make the computer print in brown).

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:

[SS],[C*]

In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (RVSON), type the relevant number of reversed T's and then hold down CTRL and press zero (RVSOFF). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string: the symbol for pi. This may appear when its value is needed in a calculation so this may look something like:

:CC=2*[PI]*R:

Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the pi symbol).

PROGRAM: SYNTAX CHECKER

```
5 REM SYTAX CHECKER - ERIC DOYLE

10 BL=10    :LN=70    :SA=49152
20 FOR L=0 TO BL:CX=0:FOR D=0 TO
 15
30 READ A:IF A>255THENPRINT"NUMB
ER TO LARGE";LN+(L*10):STOP
40 CX=CX+A:POKE SA+L*16+D,A:NEXT
 D
50 READ A:IF A><CX THENPRINT"ERR
OR IN LINE";LN+(L*10):STOP
60 NEXT L:SYS 49152:NEW
70 DATA 173,5,3,201,165,208,31,1
20,169,9,141,32,208,141,33,208,1
847
80 DATA 169,7,141,134,2,169,13,3
2,210,255,169,64,141,4,3,169,168
2
90 DATA 192,141,5,3,88,96,120,16
9,124,141,4,3,169,165,141,5,1566

100 DATA 3,169,14,141,134,2,141,
32,208,169,6,141,33,208,88,96,15
85
110 DATA 32,124,165,72,138,72,15
2,72,162,0,165,20,133,254,165,21
,1747
120 DATA 24,101,254,133,254,189,
0,2,240,18,69,254,133,254,232,18
9,2346
130 DATA 0,2,240,8,24,101,254,13
3,254,232,208,233,169,1,141,134,
2134
140 DATA 2,165,254,74,74,74,74,3
2,156,192,32,210,255,165,254,41,
2054
150 DATA 15,32,156,192,32,210,25
5,169,13,32,210,255,169,13,32,21
0,1995
160 DATA 255,169,7,141,134,2,104
,168,104,170,104,96,24,105,48,20
1,1832
170 DATA 58,16,1,96,24,105,7,96,
0,0,0,0,0,0,0,0,403
```

**by Eric Doyle**

## Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk immediately because it will be used with most of the present and future listings appearing in Your Commodore.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and press RETURN again.

If you want to turn off the checker simply type SYS49152 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same SYS command.

No system is foolproof but the chances of two errors cancelling one Many of the listings are presented in lower case. To turn your computer to lower case mode press the Commodore key and the SHIFT key at the same time. YC

| Mnemonic | Symbol | Keypress |
|---|---|---|
| [RIGHT] | | CRSR left/right |
| [LEFT] | | SHIFT & CRSR left/right |
| [DOWN] | | CRSR up/down |
| [UP] | | SHIFT & CRSR up/down |
| [F1] | | f1 key |
| [F2] | | SHIFT & f1 key |
| [F3] | | f3 key |
| [F4] | | SHIFT & f3 key |
| [F5] | | f5 key |
| [F6] | | SHIFT & f5 key |
| [F7] | | f7 key |
| [F8] | | SHIFT & f7 key |
| [HOME] | | CLR/HOME |
| [CLR] | | SHIFT & CLR/HOME |
| [RVSON] | | CTRL & 9 |
| [RVSOFF] | | CTRL & 0 |

| Mnemonic | Symbol | Keypress |
|---|---|---|
| [BLACK] | | CTRL & 1 |
| [WHITE] | | CTRL & 2 |
| [RED] | | CTRL & 3 |
| [CYAN] | | CTRL & 4 |
| [PURPLE] | | CTRL & 5 |
| [GREEN] | | CTRL & 6 |
| [BLUE] | | CTRL & 7 |
| [YELLOW] | | CTRL & 8 |
| [POUND] | | £ |
| [LARROW] | | ← |
| [UPARROW] | | ↑ |
| [PI] | | SHIFT & ↑ |
| [INST] | | SHIFT & INST/DEL |
| [REV T] | | see text |
| [Cletter] | | CBM + letter |
| [Sletter] | | SHIFT + letter |

# DON'T MISS OUT

Fill in your name and address and give this form to your newsagent.

Please order me a copy of YOUR COMMODORE and reserve/deliver me a copy every month.

NAME ....................

ADDRESS ....................

....................

....................

....................

*Newsagent:* This magazine is made available to your wholesaler through:
S.M. Distribution Ltd
6 Leigham Court Road
Streatham
LONDON
SW16 2PG

Tel: 01-677 8111




YOUR
# COMMODORE


## LISTINGS

CONSTRUCTING A COMPILER

PROGRAM: EDIT

```
0D   10 FOR X=832 TO 878
7A   20 READ B:POKEX,B
9C   30 NEXT
47   40 POKE 770,64:POKE 771,3:PO
     KE 774,243:POKE 775,166
A0   50 PRINT CHR$(14);"[CLR,SF,S
     C,SL] [SE,SD,SI,ST] CODE INS
     TALLED."
D0   60 PRINT "[SW,SA,SR,SN,SI,SN
     ,SG]!! [SD]ON'T [SE,SD,SI,ST
     ] [SB,SA,SS,SI,SC] PROGRAMS!
     !":NEW
44   70 DATA 32,96,165,134,122,13
     2,123,32,115,0,170,240,243,1
     62,255,134
C0   80 DATA 58,144,6,32,121,165,
     76,225,167,32,107,169,166,12
     2,160,4
72   90 DATA 189,0,2,232,200,153,
     251,1,201,0,208,244,76,162,1
     64
```

CONSTRUCTING A COMPILER

PROGRAM: COMPILE

```
F2   10 GOSUB 980:REM INITIALISE
0E   20 WT%=0:EF%=0:ET%=0
24   30 :
C7   40 REM *********************
     ***********
08   50 :
7A   60 DE%=0
91   70 GOSUB 1940:REM OPEN FILES
A2   80 IF DE% THEN PRINT "[SD]IS
     K FILE ERROR. [SM]ISSING FIL
     E OR [SD]ISK FULL":CLOSE2:CL
     OSE3:END
60   90 :
B8   100 :   OC$="":GOSUB 2410
72   110 :   IF EN% THEN GOTO 230
17   120 :   PRINT IL$;
B0   130 :   IF DE%=0 AND IL%<>0 T
     HEN GOSUB 2640
B6   140 :
4E   150 :   IF LEN(OC$)>0 AND ER%
     =0 THEN GOSUB 2560
9A   160 :
7E   170 :   IF ER% THEN ET%=ET%+1
     :PRINT"[RVSON]";EM$(ER%)
85   180 :   IF WR% AND ER%=0 THEN
      WT%=WT%+1:PRINT"[RVSON]";WM
     $(WR%)
54   190 IF DE%=0 AND EF%=0 THEN
     100
F2   200 :
13   210 REM *********************
     ***********
```

Listings

```
E6  220 :
DC  230 IF EF%=0 AND CD%<>0 THEN
     PRINT "[SU]NEXPECTED END OF
     FILE.":KR%=128:GOSUB6940:GO
    SUB2560
D2  240 IF EF%=0 AND CK%(CP%)<>0
     THEN PRINT "[SC]ONTROL STRU
    CTURE ERROR."
53  250 IF EF% THEN PRINT "[SS,S
    E,SV,SE,SR,SE] [SE,SR2,SO,SR
    ]. [SC]ANNOT CONTINUE..."
43  260 IF EF%=0 AND FO%>0 THEN
    PRINT "[SW]ARNING - [SF]ILE
    OPENS OUTNUMBER FILE[SPC5]CL
    OSURES."
89  270 IF EF%=0 AND FO%<0 THEN
    PRINT "[SW]ARNING - [SF]ILE
    CLOSURES OUTNUMBER FILE  OPE
    NS."
96  280 CLOSE 2:CLOSE 3
19  290 :
23  300 PRINT ET%;" ERRORS IN FI
    LE."
0D  310 PRINT WT%;" WARNINGS IN
    FILE."
DF  320 S$="":GOSUB 3960
48  330 IF SD% THEN PRINT "[SF,S
    A,ST,SA,SL]!! [SF]ORWARD [SS
    ]UBROUTINE DEFINITIONS  NOT
    MATCHED"
08  340 IF SD%=0 AND ET%=0 AND E
    F%=0 THEN GOSUB 2080
67  350 IF DE% THEN PRINT "[SD]I
    SK FILE ERROR DURING DATA FI
    LE WRITE."
0F  360 FR=FRE(0):PRINT FR;"BYTE
    S FREE."
7A  370 IF SD%=0 AND ET%=0 AND E
    F%=0THENCLR:PRINT"[SS]TARTIN
    G [SC]ODEGEN":LOAD"CODEGEN",
    8,1
FD  380 END
BD  390 :
AB  400 :
CA  410 REM ********************
    ***********
BC  420 REM ERROR MESSAGES
D6  430 REM ********************
    ***********
83  440 :
3F  450 EP%=-1
F8  460 EP%=EP%+1
27  470 READ EM$(EP%)
A1  480 IF EM$(EP%)<>"!END!" THE
    N 460
D1  490 :
E7  500 EP%=0
4A  510 EP%=EP%+1
64  520 READ WM$(EP%)
D8  530 IF WM$(EP%)<>"!END!" THE
    N 510
90  540 RETURN
12  550 :
31  560 DATA "[SPC33]"
91  570 DATA "[SS]YMBOL NOT DEFI
    NED.
FA  580 DATA "[SS]YMBOL RE-DEFIN
    ED.
87  590 DATA "[SI]NCORRECT USE O
    F TYPE DESCRIPTOR.
3F  600 DATA "[SM]ISSING EXPRESS
    ION.
59  610 DATA "[SP]ARENTHESIS ERR
    OR.
45  620 DATA "[SI]NCORRECT USE O
    F OPERATORS.
F4  630 DATA "[SS]YNTAX ERROR.
BE  640 DATA "[SN]UMERIC OVERFLO
    W.
21  650 DATA "[SG]ARBAGE AT END
    OF LINE.
11  660 DATA "[SM]ISSING SYMBOL.
37  670 DATA "[SI]LLEGAL SYMBOL.

55  680 DATA "[SF]UNCTION/OPERAT
    OR SYNTAX ERROR."
44  690 DATA "[SM]ISSING VARIABL
    E DESCRIPTOR."
55  700 DATA "[SM]ISSING OPERATO
    R."
D3  710 DATA "[ST]YPE MISMATCH E
    RROR."
9E  720 DATA "[SI]NCORRECT USE O
    F RESERVED WORD."
01  730 DATA "[SC]ONTROL STRUCTU
    RE ERROR."
F5  740 DATA "[SP]ROCEDURE DIVIS
    ION ERROR."
1B  750 DATA "[SS]TATEMENT OUTSI
    DE PROCEDURE DIVISION."
CC  760 DATA "[SC]ONTROL STRUCTU
    RE NOT MATCHED AT [SE,SN,SD]
    ."
1A  770 DATA "[SI]/[SO] FILE MOD
    E NOT DEFINED."
EC  780 DATA "[SS]UBROUTINE NOT
    DEFINED."
A9  790 DATA "[SS]UBROUTINE ALRE
    ADY DEFINED."
2F  800 DATA "[SS]UBROUTINE STRU
    CTURE ERROR."
D3  810 DATA "[SN]O SUBROUTINE E
    RROR."
D5  820 DATA "[SI]LLEGAL USE OF
    SUBROUTINE NAME."
EA  830 DATA "[SB]AD SUBROUTINE
    NAME."
DC  840 DATA "[SS]UBROUTINE INSI
    DE PROCEDURE DIVISION."
A2  845 DATA "[SI]DENTIFIER TOO
    LONG."
F9  850 DATA "!END!"
65  860 :
53  870 :
C0  880 DATA "[SG]ARBAGE AT END
    OF LINE."
BE  890 DATA "[SD]ECLARATION INS
    IDE PROCEDURE DIVISION."
8A  900 DATA "[SS]UBROUTINE DEFI
    NITIONS INSIDE PROCEDURE DIV
    ISION."
85  910 DATA "!END!"
A1  920 :
9F  930 :
D6  940 REM ********************
    ***********
19  950 REM INITIALISE
02  960 REM ********************
    ***********
F7  970 :
FD  980 PRINT "[CLR]------------
    ----"
FE  990 PRINT CHR$(14);"[SF,SC,S
    L] [SC]OMPILER"
B9  1000 PRINT "[SV]ERSION 1.0/[
    SC]64"
24  1005 PRINT "[SS]TEVE [SC]ARR
    IE 1988"
1D  1010 PRINT "----------------
    [DOWN]"
C5  1020 :
6C  1030 REM ** INTEGERS **
3E  1040 SS%=200:VT%=1:SP%=0:TT%
    =1:TP%=0:CP%=0:CD%=0:FO%=0
24  1050 :
89  1060 REM **  ARRAYS  **
02  1070 DIM KW$(128),L$(50),L(5
    0)
2C  1080 DIM VN$(SS%),VT%(SS%),V
    V%(SS%)
B7  1090 DIM LS$(SS%),CK%(SS%),V
    %(4),LN%(SS%)
13  1100 DIM TK%(50),SK%(50),EM$
    (30),WM$(5)
60  1110 :
D7  1120 GOSUB 450:REM ERROR MES
    SAGES
94  1130 GOSUB 1230:REM DEFINE F
    UNCTIONS
FF  1140 GOSUB 1430:REM KEYWORD
    TABLE
CB  1150 GOSUB 1790:REM GET FILE
    NAMES
02  1160 RETURN
AC  1170 :
9A  1180 :
DB  1190 REM ********************
    ***********
C5  1200 REM DEFINE FUNCTIONS
E7  1210 REM ********************
    ***********
F2  1220 :
BC  1230 DEF FNGC(LP)=ASC(MID$(I
    L$,LP,1))
E6  1240 :
15  1250 DEF FNN(X)=(C%>=48 AND
    C%<=57) OR C%=36 OR C%=37 OR
     C%=64 OR C%=46
```

```
BF 1260 DEF FNA(X)=C%=>65 AND C%<=90 OR C%=34
72 1270 DEF FNAN(X)=FNN(0) OR FNA(0)
CF 1280 DEF FNBC(X)=C%=40 OR C%=41
F4 1290 DEF FNSP(X)=C%=32 OR C%=9
FF 1300 DEF FNTK(X)=C%=42 OR C%=43 OR C%=45 OR C%=47 OR (C%=>60 AND C%<=62)
67 1310 DEF FNCC(X)=C%=44 OR C%=59 OR C%=39
17 1320 :
90 1330 DEF FNCK(X)=ABS(FNAN(0)+2*FNTK(0)+3*FNBC(0)+4*FNSP(0)+5*FNCC(0))
24 1340 DEF FNHI(DV)=INT(DV/256)
C3 1350 DEF FNLO(DV)=DV-256*FNHI(DV)
DB 1360 RETURN
65 1370 :
53 1380 :
B2 1390 REM ******************************
20 1400 REM READ IN KEYWORD TABLE
BE 1410 REM ******************************
AB 1420 :
50 1430 KW%=-1
0E 1440 KW%=KW%+1
BA 1450 READ KW$(KW%)
E0 1460 IF KW$(KW%)="OR" THEN FS%=KW%+128
F7 1470 IF KW$(KW%)="--" THEN FE%=KW%+128
F9 1480 IF KW$(KW%)<>"!END!" THEN 1440
59 1490 RETURN
DB 1500 :
3A 1510 REM ** KEYWORDS **
65 1520 DATA END
AC 1530 DATA VAR,INT,STRING,ARRAY
FA 1540 DATA BSET,WSET
B3 1550 DATA LOOP,ENDLOOP,WHILE,WHEN
99 1560 DATA IF,ENDIF,ELSE,CHAROUT,FOPEN
CC 1570 DATA BEGIN,FCLOSE,FOR,INPUT,OUTPUT
04 1580 DATA WRITE,READ,SUBROUTINE,RETURN
B5 1590 DATA CALL,EXTERNAL,FORWARD
B0 1600 DATA CLS,WAIT,HALT,SYSCALL
6A 1610 :
24 1620 REM ** OPERATORS **
72 1630 DATA OR,XOR,AND,NOT,=,<>,<=,>=,<,>
E4 1640 DATA +,-,*,/,++,--
42 1650 :
FA 1660 REM ** FUNCTIONS **
64 1670 DATA BYTE,WORD,LEN,CHAR,STR,ASCII
F7 1680 DATA STOP,KEY,CHARIN
DC 1690 DATA LEFT,RIGHT,MID
A9 1700 DATA SYSFN,IOSTAT,DSTAT,DERR
BE 1710 :
BA 1720 DATA "!END!"
F2 1730 :
EB 1740 :
49 1750 REM ******************************
23 1760 REM GET FILENAMES
75 1770 REM ******************************
C0 1780 :
7A 1790 INPUT "[DOWN,SS]OURCE FILENAME (.FCL) ";FS$
55 1800 IF FS$="" THEN 1790
23 1810 :
65 1820 FC$=FS$+".SFC"
2C 1830 FY$=FS$+".SYM"
7A 1840 FL$=FS$+".LTR"
C6 1850 FS$=FS$+".FCL"
B3 1860 PRINT"[DOWN,SC]OMPILING ";FS$
DB 1870 RETURN
65 1880 :
53 1890 :
B2 1900 REM ******************************
0E 1910 REM OPEN DISK FILES
BE 1920 REM ******************************
AB 1930 :
83 1940 DE%=0
EB 1950 OPEN 2,8,2,FS$+",P,R"
F1 1960 IF ST OR DS THEN DE%=-1:RETURN
DB 1970 GET#2,A$:GET#2,A$
24 1980 IF ST THEN DE%=-1:RETURN
99 1990 OPEN 3,8,3,"@0:"+FC$+",S,W"
61 2000 IF ST OR DS THEN DE%=-1
6F 2010 RETURN
D1 2020 :
CF 2030 :
0C 2040 REM ******************************
57 2050 REM WRITE DATA FILES
BB 2060 REM ******************************
24 2070 :
CC 2080 OPEN 4,8,4,"@0:"+FY$+",S,W"
78 2090 IF ST OR DS THEN DE%=-1:RETURN
7A 2100 PRINT "[DOWN,SW]RITING SYMBOLS.";
E5 2110 PRINT#4,VT%
E5 2120 IF VT%=1 THEN GOTO 2190
CB 2130 FOR X=1 TO VT%-1
3B 2140 :   PRINT#4,VN$(X)
1C 2150 :   PRINT#4,VT%(X)
20 2160 :   PRINT#4,VV%(X)
FE 2170 :   PRINT".";
3B 2180 :NEXT
62 2190 CLOSE 4
39 2200 PRINT
90 2210 :
2F 2220 OPEN 5,8,5,"@0:"+FL$+",S,W"
6C 2230 IF ST OR DS THEN DE%=-1:RETURN
8F 2240 PRINT "[DOWN,SW]RITING LITERALS.";
18 2250 PRINT#5,TT%
BE 2260 IF TT%=1 THEN GOTO 2320
9D 2270 FOR X=1 TO TT%-1
61 2280 :   PRINT#5,LN%(X)
95 2290 :   PRINT#5,LS$(X)
7C 2300 :   PRINT".";
8D 2310 NEXT
EC 2320 CLOSE 5
BA 2330 PRINT
A3 2340 RETURN
0D 2350 :
7B 2360 :
7A 2370 REM ******************************
D1 2380 REM READ LINE FROM DISK FILE
86 2390 REM ******************************
53 2400 :
AA 2410 IL$="":DE%=0
A0 2420 GET#2,IA$:GET#2,IB$:IF IA$="" AND IB$="" THEN EN%=-1:RETURN
7F 2430 GET#2,LO$:GET#2,HI$
DA 2431 LO$=LO$+CHR$(0):HI$=HI$+CHR$(0)
92 2440 PRINT ASC(LO$)+256*ASC(HI$);
D4 2450 GET#2,FC$:IF FC$="" THEN FC$=CHR$(13)
0E 2460 IL$=IL$+FC$
41 2470 IF FC$<>CHR$(13) THEN 2450
0A 2480 IL%=LEN(IL$)
4D 2490 RETURN
F7 2500 :
ED 2510 :
4E 2520 REM ******************************
7E 2530 REM WRITE TO FILE
5A 2540 REM ******************************
C5 2550 :
D9 2560 PRINT#3,LEN(OC$):PRINT#3,OC$;
9A 2570 RETURN
24 2580 :
12 2590 :
59 2600 REM ******************************
8B 2610 REM DO LEXICAL/SYNTAX/SEMANTIC
55 2620 REM ******************************
6A 2630 :
1D 2640 ER%=0:WR%=0:SP%=0:TP%=0
77 2650 GOSUB 2750
15 2660 IF ER%=0 THEN GOSUB 3270
F6 2670 RETURN
B8 2680 :
B6 2690 :
E5 2700 REM ******************************
0F 2710 REM ******************************
E2 2720 REM PERFORM LEXICAL ANALYSIS
1B 2730 REM ******************************
84 2740 :
E5 2750 GOSUB 3030
BE 2760 IF L$(1)<>";" THEN GOSUB 2840
52 2770 RETURN
DC 2780 :
CA 2790 :
01 2800 REM ******************************
D6 2810 REM TOKENISE LINE IN L$
1C 2820 REM ******************************
23 2830 :
74 2840 EP%=1
17 2850 :
64 2860 DP%=-1
7B 2870 :
76 2880 DP%=DP%+1
0B 2890 MA%=L$(EP%)=KW$(DP%)
17 2900 IF MA%=0 AND DP%<>KW% THEN 2880
53 2910 :
73 2920 IF MA% THEN L$(EP%)=CHR$(128+DP%)
C8 2930 EP%=EP%+1
B7 2940 IF EP%<=L% THEN 2860
AB 2950 :
15 2960 RETURN
9F 2970 :
95 2980 :
06 2990 REM ******************
```

```
     ***********
10   3000 REM SPLIT LINE IL$ INTO
     L$()
12   3010 REM *******************
     ***********
ED   3020 :
7E   3030 L%=0:LP=0:CT%=-1:L$(L%)
     ="":QF%=0
D1   3040 :
30   3050 LP=LP+1
68   3060 C%=FNGC(LP):LT%=CT%:CT%
     =FNCK(0)
7A   3070 IF C%=13 THEN 3190
71   3080 IF C%<>34 THEN 3120
9B   3090 :  QF%=NOT(QF%)
5B   3100 :   IF QF% THEN 3150
3B   3110 :   GOTO 3160
48   3120 IF QF% THEN 3160
4C   3130 IF CT%=4 THEN 3050
9D   3140 IF CT%=LT% AND CT%<>5 A
     ND CT%<>3 THEN 3160
93   3150 L%=L%+1:L$(L%)=""
BE   3160 L$(L%)=L$(L%)+CHR$(C%)
81   3170 GOTO 3050
42   3180 :
85   3190 L%=L%+1:L$(L%)=CHR$(13)
     :RETURN
B6   3200 :
AC   3210 :
0F   3220 REM *******************
     ***********
F1   3230 REM *******************
     ***********
5A   3240 REM PERFORM SYNTAX/SEMA
     NT ANALYSIS
CD   3250 REM *******************
     ***********
F2   3260 :
B1   3270 IP%=1
AC   3280 IF L$(IP%)=";" THEN RET
     URN
E5   3290 IF ASC(L$(IP%))>127 THE
     N GOSUB 3370:RETURN
BE   3300 GOSUB 3590:RETURN
C0   3310 :
3E   3320 :
1C   3330 REM *******************
     ***********
A3   3340 REM ROUTING OF KEYWORDS
48   3350 REM *******************
     ***********
17   3360 :
D9   3370 KR%=ASC(L$(IP%))
D2   3380 IF CD% AND (KR%=129 OR
     KR%=154 OR KR%=155) THEN WR%
     =2
DB   3390 IF CD%=0 AND KR%<>129 A
     ND KR%<>144  AND KR%<>151 AN
     D KR%<154 THEN ER%=18:RETURN
05   3400 IF KR%=>FS% THEN ER%=12
     :RETURN
20   3410 ON KR%-127 GOSUB 6950,5
     660,3500,3500,3500,5950,5950
     ,6120,6280,3510,3510
08   3420 IF KR%>138 THEN ON KR%-
     138 GOSUB 6450,6710,6590,708
     0,7270,6830,7460,3510
7A   3430 IF KR%>146 THEN ON KR%-
     146 GOSUB 3510,3510,7590,784
     0,8110,8290,8380,8480,8650
B7   3440 IF KR%>155 THEN ON KR%-
     155 GOSUB 8820,8910,8820,891
     0.
09   3450 RETURN
AB   3460 :
A1   3470 :
F4   3480 REM ****** SET ERROR FL
     AG ******
95   3490 :
E6   3500 ER%=3:RETURN
7C   3510 ER%=16:RETURN
43   3520 RETURN
ED   3530 :
DB   3540 :
30   3550 REM *******************
     ***********
DE   3560 REM HANDLE SYMBOL-TYPE
     EXPR.
0C   3570 REM *******************
     ***********
33   3580 :
42   3590 IF CD%=0 THEN ER%=19:RE
     TURN
45   3600 S$=L$(IP%):C%=ASC(S$):I
     F FNA(0)=0 OR C%=34 THEN ER%
     =7:RETURN
49   3610 GOSUB 3960
E2   3620 IF ER% THEN RETURN
1F   3630 IF CV%<5 THEN 3660
9B   3640 IP%=IP%+1:IF L$(IP%)<>C
     HR$(13) THEN WR%=1
88   3650 O%=153:DV=AD%:GOSUB 534
     0:RETURN
E8   3660 REM ADDRESS OF SYMBOL I
     N VAR TA%
4A   3670 TS%=CV%:AS%=AR%:IF AS%
     THEN OC$=OC$+CHR$(2)
EF   3680 TA%=AD%:IP%=IP%+1
39   3690 IF ASC(L$(IP%))<>FS%+4
     THEN 3800
FE   3700 IP%=IP%+1:IF L$(IP%)=CH
     R$(13) THEN ER%=4:RETURN
B9   3710 GOSUB 4200:IF ER% THEN
     RETURN
28   3720 IF TS%<>CV% THEN ER%=15
     :RETURN
7B   3730 O%=11:IF TS%=1 THEN O%=
     4
AE   3740 IF AS% AND O%=4 THEN O%
     =24
BC   3750 IF AS% AND O%=11 THEN O
     %=26
AE   3760 IF AS% THEN OC$=OC$+CHR
     $(27)
25   3770 DV=TA%:GOSUB 5340
5C   3780 RETURN
E6   3790 :
95   3800 REM ** CHECK FOR ++/--
CA   3810 :
4E   3820 IF ASC(L$(IP%))<>FS%+14
      THEN 3860
9F   3830 IF TS%<>1 THEN ER%=15:R
     ETURN
CA   3840 O%=6:IF AS% THEN O%=28
BC   3850 GOTO 3760
99   3860 IF ASC(L$(IP%))<>FS%+15
      THEN ER%=4 RETURN
F0   3870 IF TS%<>1 THEN ER%=15:R
     ETURN
B0   3880 O%=7:IF AS% THEN O%=29
54   3890 GOTO 3760
71   3900 :
6F   3910 :
AC   3920 REM *******************
     ***********
2E   3930 REM FIND SYMBOL IN TABL
     E
98   3940 REM *******************
     ***********
47   3950 :
D2   3960 ER%=1
09   3970 AD%=0:SD%=0
A1   3980 :
20   3990 AD%=AD%+1
A5   4000 IF S$=VN$(AD%) THEN ER%
     =0
68   4010 IF VT%(AD%)=5 THEN SD%=
     -1
A4   4020 IF ER% AND AD%<>VT% THE
     N 3990
F7   4030 :
C7   4040 CV%=VT%(AD%)
7A   4050 IF CV%<3 OR CV%>4 OR ER
     % THEN AR%=0:RETURN
94   4060 AR%=-1:CV%=CV%-2
EC   4070 IP%=IP%+1:IF L$(IP%)<>"
     (" THEN ER%=7:RETURN
78   4080 IP%=IP%+1:SP%=SP%+3:SK%
     (SP%-2)=AR%:SK%(SP%-1)=AD%:S
     K%(SP%)=CV%
F4   4090 GOSUB 4200:IF ER% THEN
     RETURN
5B   4100 IF CV%<>1 THEN ER%=15:R
     ETURN
6D   4110 IF L$(IP%)<>")" THEN ER
     %=7:RETURN
FB   4120 AR%=SK%(SP%-2):AD%=SK%(
     SP%-1):CV%=SK%(SP%):SP%=SP%-
     3
BC   4130 RETURN
06   4140 :
7C   4150 :
FF   4160 REM *******************
     ***********
6F   4170 REM EXPRESSION ANALYSIS
CB   4180 REM *******************
     ***********
54   4190 :
C4   4200 IP%=IP%-1
11   4210 SP%=SP%+1:SK%(SP%)=0
EB   4220 OI%=0
3B   4230 IP%=IP%+1
20   4240 S$=L$(IP%):C%=ASC(S$)
9E   4250 IF C%=0 THEN GOTO 4230
D8   4260 IF (FNCK(0)=0 AND C%<FS
     %) OR C%=13 OR FNCC(0) THEN
     4300
DA   4270 GOSUB 4430:IF ER% THEN
     RETURN
8E   4280 IF S$<>")" THEN GOTO 42
     30
E8   4290 :
2F   4300 IF SK%(SP%)=0 THEN 4360
AB   4310 O%=3:IF CV%=2 THEN O%=1
     5
18   4320 GOSUB 4670
E0   4330 O%=C%:GOSUB 4670
2C   4340 GOTO 4300
34   4350 :
D0   4360 SP%=SP%-1:S$=""
85   4370 IF SP%<0 THEN ER%=7
A3   4380 RETURN
0D   4390 :
85   4400 REM **** ANALYSIS OF LI
     NE ****
71   4410 :
6F   4420 :
C2   4430 IF C%<FS% THEN GOTO 458
     0
B4   4440 IF C%>FE% THEN GOSUB 48
     30:RETURN
3C   4450 IF OI% THEN ER%=6:RETUR
     N
EC   4460 OI%=-1
BD   4470 :
1B   4480 IF C%>SK%(SP%) OR SK%(S
     P%)=0 THEN GOTO 4550
16   4490 TV%=C%
24   4500 O%=3:IF CV%=2 THEN O%=1
     5
CB   4510 GOSUB 4670
17   4520 O%=C%:GOSUB 4670
62   4530 C%=TV%
EC   4540 GOTO 4480
30   4550 O%=2:IF CV%=2 THEN O%=1
     4
09   4560 GOSUB 4670
65   4570 RETURN
CF   4580 :
93   4590 IF C%=40 THEN GOSUB 421
     0:RETURN
F0   4600 IF C%=41 THEN RETURN
03   4610 OI%=0
6B   4620 IF C%=34 THEN GOSUB 498
     0:RETURN
```

```
01   4630 GOSUB 5090:RETURN
08   4640 :
11   4650 REM **** GENERATE OP CO
     DES ****
7C   4660 :
6F   4670 IF O%>=FS% AND CV%=2 TH
     EN OC$=OC$+CHR$(16)
56   4680 OC$=OC$+CHR$(O%)
3F   4690 IF CV%=2 AND O%>FS% AND
      (O%<FS%+4 OR O%>FS%+10) THE
     N ER%=15:RETURN
44   4700 IF CV%=2 AND O%=FS%+10
     THEN RETURN
2A   4710 IF O%>=FS% THEN CV%=1:R
     ETURN
E9   4720 IF O%=2 OR O%=14 THEN S
     P%=SP%+1:SK%(SP%)=C%:TP%=TP%
     +1:TK%(TP%)=CV%
DC   4730 IF O%<>3 AND O%<>15 THE
     N RETURN
AE   4740 C%=SK%(SP%):SP%=SP%-1
E0   4750 IF CV%=TK%(TP%) THEN TP
     %=TP%-1:RETURN
F4   4760 ER%=15:RETURN
8E   4770 :
84   4780 :
17   4790 REM *******************
     ***********
35   4800 REM FUNCTION DISPATCH
63   4810 REM *******************
     ***********
DC   4820 :
FB   4830 IP%=IP%+1:IF L$(IP%)<>"
     (" THEN ER%=7:RETURN
39   4840 SP%=SP%+1:SK%(SP%)=C%
F2   4850 R%=C%-FE%
95   4860 ON R% GOSUB 9040,9040,9
     120,9220,9220,9120,9320,9320
     ,9040,9420
A8   4870 IF R%>10 THEN ON R%-10
     GOSUB 9420,9570,9760,9320,93
     20,9910
D2   4880 IF L$(IP%)<>")" THEN ER
     %=7:RETURN
61   4890 C%=SK%(SP%):SP%=SP%-1
11   4900 OC$=OC$+CHR$(C%)
CF   4910 RETURN
71   4920 :
6F   4930 :
AC   4940 REM *******************
     ***********
B4   4950 REM LITERAL STRING HAND
     LER
98   4960 REM *******************
     ***********
47   4970 :
9F   4980 IF RIGHT$(S$,1)<>CHR$(3
     4) THEN ER%=7:RETURN
3D   4990 LS$(TT%)=MID$(S$,2,LEN(
     S$)-2):LN%(TT%)=LEN(S$)-2
EA   5000 OC$=OC$+CHR$(10)+CHR$(F
     NLO(TT%))+CHR$(FNHI(TT%))
16   5010 CV%=2:TT%=TT%+1
21   5020 RETURN
83   5030 :
F9   5040 :
12   5050 REM *******************
     ***********
FB   5060 REM NUMERIC & SYMBOL EV
     ALUATION
4E   5070 REM *******************
     ***********
D1   5080 :
56   5090 IF FNN(0)=0 THEN GOTO 5
     140
1F   5100 GOSUB 5440
35   5110 IF ER%=0 THEN O%=1:GOSU
     B 5340
9A   5120 RETURN
24   5130 :
F3   5140 IF FNA(0)=0 THEN GOTO 5
     260
43   5150 GOSUB 3960
87   5160 IF CV%>4 THEN ER%=26:RE
     TURN
F6   5170 IF ER% THEN RETURN
82   5180 DV=AD%
C9   5190 O%=12:IF CV%=1 THEN O%=
     5
BD   5200 IF AR% AND O%=5 THEN O%
     =23
93   5210 IF AR% AND O%=12 THEN O
     %=25
E3   5220 IF AR% THEN OC$=OC$+CHR
     $(30)
A9   5230 GOSUB 5340
02   5240 RETURN
AC   5250 :
33   5260 IF ER%=0 THEN ER%=7
24   5270 RETURN
8E   5280 :
84   5290 :
17   5300 REM *******************
     ***********
CF   5310 REM PLACE VALUE IN OPCO
     DE STRING
63   5320 REM *******************
     ***********
DC   5330 :
D4   5340 OC$=OC$+CHR$(O%)
A5   5350 OC$=OC$+CHR$(FNLO(DV))
F1   5360 OC$=OC$+CHR$(FNHI(DV))
80   5370 RETURN
23   5380 :
19   5390 :
B2   5400 REM *******************
     ***********
65   5410 REM EVALUATE NUMERIC ST
     RING
EE   5420 REM *******************
     ***********
71   5430 :
97   5440 DV=0:B%=10
AA   5450 T$=LEFT$(S$,1)
95   5460 IF T$="$" THEN B%=16
69   5470 IF T$="%" THEN B%=2
EE   5480 IF T$="@" THEN B%=8
8A   5490 ER%=0:P%=1:IF B%<>10 TH
     EN P%=2
AB   5500 :
BE   5510 C%=ASC(MID$(S$,P%,1))
A0   5520 DV=DV*B%+(C%-48-(B%>10)
     *(7*(C%>65)))
5C   5530 P%=P%+1
2F   5540 IF P%<=LEN(S$) THEN 551
     0
F9   5550 :
4E   5560 IF DV>65535 THEN ER%=8
B0   5570 CV%=1
6F   5580 RETURN
D1   5590 :
CF   5600 :
0C   5610 REM *******************
     ***********
56   5620 REM *******************
     ***********
13   5630 REM VAR KEYWORD (DECLAR
     E VARS)
6D   5640 REM *******************
     ***********
12   5650 :
8C   5660 IP%=IP%+1:TP%=ASC(L$(IP
     %))
30   5670 IF TP%<>130 AND TP%<>13
     1 THEN ER%=13:RETURN
7C   5680 :
FD   5690 IP%=IP%+1
54   5700 S$=L$(IP%)
48   5710 IF S$=CHR$(13) THEN ER%
     =10:RETURN
BC   5720 C%=ASC(S$):IF FNA(0)=0
     OR C%=34 THEN ER%=11:RETURN
2B   5730 GOSUB 3960:IF ER%=0 THE
     N ER%=2:RETURN
B9   5740 IF CV%>4 THEN ER%=26:RE
     TURN
C0   5750 ER%=0
BB   5760 IF LEN(S$)>20 THEN ER%=
     29:RETURN
E0   5770 VN$(VT%)=S$:VT%(VT%)=TP
     %-129
21   5780 IP%=IP%+1:S$=L$(IP%)
72   5790 IF ASC(S$)<>132 THEN 58
     50
B1   5800 IP%=IP%+1:IF L$(IP%)<>"
     (" THEN ER%=7:RETURN
95   5810 IP%=IP%+1:S$=L$(IP%):GO
     SUB 5440:IF ER% THEN RETURN
A8   5820 IP%=IP%+1:IF L$(IP%)<>"
     )" THEN ER%=7:RETURN
AF   5830 VV%(VT%)=DV:VT%(VT%)=VT
     %(VT%)+2
CD   5840 IP%=IP%+1:S$=L$(IP%)
B7   5850 V%(VT%(VT%))=V%(VT%(VT%
     ))+1
CA   5860 VT%=VT%+1:IF S$="," THE
     N 5690
96   5870 IF S$<>CHR$(13) THEN ER
     %=9
80   5880 RETURN
23   5890 :
19   5900 :
B2   5910 REM *******************
     ***********
E2   5920 REM BSET/WSET KEYWORDS
EE   5930 REM *******************
     ***********
71   5940 :
07   5950 IP%=IP%+1:TS%=1
7A   5960 GOSUB 4200:IF ER% THEN
     RETURN
16   5970 IF CV%<>1 THEN ER%=15:R
     ETURN
6B   5980 IF L$(IP%)<>"," THEN ER
     %=7:RETURN
C8   5990 IP%=IP%+1
FB   6000 OC$=OC$+CHR$(2)
3C   6010 GOSUB 4200:IF ER% THEN
     RETURN
4C   6020 IF CV%<>1 THEN ER%=15:R
     ETURN
14   6030 IF ASC(L$(IP%))<>13 THE
     N WR%=1
5A   6040 OC$=OC$+CHR$(3)+CHR$(8)
     +CHR$(KR%)
37   6050 RETURN
F9   6060 :
F7   6070 :
24   6080 REM *******************
     ***********
E7   6090 REM LOOP KEYWORD
30   6100 REM *******************
     ***********
CF   6110 :
09   6120 OC$=OC$+CHR$(KR%)
AB   6130 CP%=CP%+1:CK%(CP%)=1
16   6140 IP%=IP%+1
7E   6150 C%=ASC(L$(IP%)):IF C%=1
     3 THEN RETURN
E6   6160 IF C%<>137 THEN ER%=16:
     RETURN
F7   6170 IP%=IP%+1
69   6180 GOSUB 4200:IF ER% THEN
     RETURN
45   6190 OC$=OC$+CHR$(137)
AB   6200 IF ASC(L$(IP%))<>13 THE
     N WR%=1
D4   6210 RETURN
5E   6220 :
54   6230 :
C7   6240 REM *******************
     ***********
D5   6250 REM ENDLOOP KEYWORD
D3   6260 REM *******************
     ***********
AC   6270 :
64   6280 OC$=OC$+CHR$(KR%)
EF   6290 IF CK%(CP%)=0 OR CK%(CP
     %)<>1 THEN ER%=17:RETURN
```

```
1C  6300 CP%=CP%-1
03  6310 IP%=IP%+1
7B  6320 C%=ASC(L$(IP%)):IF C%=1
     3 THEN RETURN
7F  6330 IF C%<>138 THEN ER%=16:
     RETURN
69  6340 IP%=IP%+1
83  6350 GOSUB 4200:IF ER% THEN
     RETURN
0A  6360 OC$=OC$+CHR$(138)
20  6370 IF L$(IP%)<>CHR$(13) TH
     EN WR%=1
8A  6380 RETURN
34  6390 :
23  6400 :
48  6410 REM ********************
     ***********
CA  6420 REM IF KEYWORD
44  6430 REM ********************
     ***********
7B  6440 :
0E  6450 IP%=IP%+1
88  6460 CP%=CP%+1:CK%(CP%)=2
E6  6470 IF ASC(L$(IP%))=13 THEN
     ER%=7:RETURN
54  6480 GOSUB 4200:IF ER% THEN
     RETURN
49  6490 :
8C  6500 IF ASC(L$(IP%))<>13 THE
     N WR%=1
01  6510 OC$=OC$+CHR$(KR%)
1F  6520 RETURN
A1  6530 :
9F  6540 :
FC  6550 REM ********************
     ***********
4A  6560 REM ELSE KEYWORD
28  6570 REM ********************
     ***********
F7  6580 :
7A  6590 IP%=IP%+1
9F  6600 IF L$(IP%)<>CHR$(13) TH
     EN WR%=1
05  6610 OC$=OC$+CHR$(KR%)
A3  6620 IF CK%(CP%)<>2 OR CK%(C
     P%)=0 THEN ER%=17:RETURN
4A  6630 CK%(CP%)=3
87  6640 RETURN
29  6650 :
24  6660 :
B7  6670 REM ********************
     ***********
BC  6680 REM ENDIF KEYWORD
83  6690 REM ********************
     ***********
7C  6700 :
FD  6710 IP%=IP%+1
00  6720 IF L$(IP%)<>CHR$(13) TH
     EN WR%=1
08  6730 OC$=OC$+CHR$(KR%)
13  6740 IF (CK%(CP%)<>2 AND CK%
     (CP%)<>3) OR CK%(CP%)=0 THEN
      ER%=17:RETURN
30  6750 CP%=CP%-1
0C  6760 RETURN
B6  6770 :
AC  6780 :
0F  6790 REM ********************
     ***********
1F  6800 REM BEGIN KEYWORD
1B  6810 REM ********************
     ***********
84  6820 :
5F  6830 IF CD% THEN ER%=18:RETU
     RN
30  6840 IP%=IP%+1:IF ASC(L$(IP%
     ))<>13 THEN WR%=1
04  6850 CD%=-1
FA  6860 OC$=OC$+CHR$(KR%)
7E  6870 RETURN
C0  6880 :
3E  6890 :
1D  6900 REM ********************
     ***********
19  6910 REM END KEYWORD
48  6920 REM ********************
     ***********
17  6930 :
70  6940 PRINT "[SE]ND CODE SUPP
     LIED COURTESY OF COMPILER."
5F  6950 IF SH% THEN SH%=0
5A  6960 IF CD%=0 THEN ER%=18:RE
     TURN
F1  6970 IP%=IP%+1:IF ASC(L$(IP%
     ))<>13 THEN WR%=1
C7  6980 CD%=0
E5  6990 IF CK%(CP%)<>0 THEN ER%
     =20:RETURN
9D  7000 OC$=OC$+CHR$(KR%)
F3  7010 RETURN
BD  7020 :
AB  7030 :
E0  7040 REM ********************
     ***********
0B  7050 REM CHAROUT KEYWORD
FC  7060 REM ********************
     ***********
83  7070 :
AC  7080 CO%=0
9D  7090 IP%=IP%+1:IF L$(IP%)<>"
     #" THEN 7150
E1  7100 IP%=IP%+1:GOSUB 4200:IF
      ER% THEN RETURN
AE  7110 IF CV%<>1 THEN ER%=15:R
     ETURN
29  7120 OC$=OC$+CHR$(18):CO%=-1
2D  7130 IF L$(IP%)<>"," THEN ER
     %=7:RETURN
42  7140 IP%=IP%+1
F4  7150 GOSUB 4200:IF ER% THEN
     RETURN
44  7160 IF CV%<>1 THEN ER%=15:R
     ETURN
B5  7170 IF ASC(L$(IP%))<>13 THE
     N WR%=1
DC  7180 OC$=OC$+CHR$(KR%)
BB  7190 IF CO% THEN OC$=OC$+CHR
     $(33)
B2  7200 RETURN
7C  7210 :
6A  7220 :
A1  7230 REM ********************
     ***********
CE  7240 REM FOPEN KEYWORD
BD  7250 REM ********************
     ***********
42  7260 :
0C  7270 IP%=IP%+1:GOSUB 4200:IF
      ER% THEN RETURN
33  7280 IF CV%<>1 THEN ER%=15:R
     ETURN
14  7290 OC$=OC$+CHR$(2)
FE  7300 IF L$(IP%)<>"," THEN ER
     %=7:RETURN
D4  7310 IP%=IP%+1:GOSUB 4200:IF
      ER% THEN RETURN
0E  7320 IF CV%<>2 THEN ER%=15:R
     ETURN
0D  7330 IF ASC(L$(IP%))<> 146 T
     HEN ER%=20:RETURN
F5  7340 IP%=IP%+1
4E  7350 C%=ASC(L$(IP%)):IF C%<>
     147 AND C%<>148 THEN ER%=20:
     RETURN
FB  7360 OC$=OC$+CHR$(3)+CHR$(8)
     +CHR$(C%)+CHR$(KR%)
94  7370 IP%=IP%+1:IF ASC(L$(IP%
     ))<>13 THEN WR%=1
41  7380 FO%=FO%+1
74  7390 RETURN
3E  7400 :
34  7410 :
A7  7420 REM ********************
     ***********
F9  7430 REM FCLOSE KEYWORD
B2  7440 REM ********************
     ***********
0D  7450 :
EB  7460 IP%=IP%+1:IF ASC(L$(IP%
     ))=13 THEN ER%=7:RETURN
F6  7470 GOSUB 4200:IF ER% THEN
     RETURN
9A  7480 IF CV%<>1 THEN ER%=15:R
     ETURN
FA  7490 IF ASC(L$(IP%))<>13 THE
     N WR%=1
7B  7500 OC$=OC$+CHR$(KR%)
DD  7510 FO%=FO%-1
F3  7520 RETURN
BD  7530 :
AB  7540 :
E0  7550 REM ********************
     ***********
2E  7560 REM WRITE KEYWORD
FC  7570 REM ********************
     ***********
83  7580 :
53  7590 CO%=0:FR%=-1
95  7600 IP%=IP%+1:IF L$(IP%)<>"
     #" THEN IP%=IP%-1:GOTO 7650
E1  7610 IP%=IP%+1:GOSUB 4200:IF
      ER% THEN RETURN
AE  7620 IF CV%<>1 THEN ER%=15:R
     ETURN
29  7630 OC$=OC$+CHR$(18):CO%=-1
2D  7640 IF L$(IP%)<>"," THEN ER
     %=7:RETURN
42  7650 IP%=IP%+1
99  7660 C%=ASC(L$(IP%))
92  7670 IF C%<>13 THEN 7710
6A  7680 IF FR% THEN OC$=OC$+CHR
     $(21)
85  7690 IF CO% THEN OC$=OC$+CHR
     $(33)
BC  7700 RETURN
D4  7710 IF C%=44 THEN OC$=OC$+C
     HR$(22):FR%=0:GOTO 7650
49  7720 IF C%=39 THEN OC$=OC$+C
     HR$(21):FR%=-1:GOTO 7650
0A  7730 IF C%=59 THEN FR%=0:GOT
     O 7650
87  7740 GOSUB 4200:IF ER% THEN
     RETURN
AD  7750 OC$=OC$+CHR$(CV%+18)
EB  7760 FR%=-1
9A  7770 GOTO 7660
B8  7780 :
B6  7790 :
E5  7800 REM ********************
     ***********
28  7810 REM READ KEYWORD
F1  7820 REM ********************
     ***********
8E  7830 :
2B  7840 CO%=0
B0  7850 IP%=IP%+1:IF L$(IP%)<>"
     #" THEN IP%=IP%-1:GOTO 7900
BC  7860 IP%=IP%+1:GOSUB 4200:IF
      ER% THEN RETURN
03  7870 IF CV%<>1 THEN ER%=15:R
     ETURN
D3  7880 OC$=OC$+CHR$(17):CO%=-1
EE  7890 IF L$(IP%)<>"," THEN ER
     %=7:RETURN
5F  7900 IP%=IP%+1
19  7910 S$=L$(IP%):GOSUB 3960:I
     F ER% THEN RETURN
4D  7920 IF CV%>4 THEN ER%=26:RE
     TURN
03  7930 IF AR% THEN OC$=OC$+CHR
     $(30)
A2  7940 OC$=OC$+CHR$(30+CV%)
BC  7950 O%=11:IF CV%=1 THEN O%=
     4
7A  7960 IF AR% AND O%=4 THEN O%
     =24
```

```
E8  7970 IF AR% AND O%=11 THEN O
    %=26
D2  7980 DV=AD%:GOSUB 5340
B6  7990 IP%=IP%+1:C%=ASC(L$(IP%
    ))
B6  8000 IF C%<>13 THEN 8030
78  8010 IF CO% THEN OC$=OC$+CHR
    $(33)
FD  8020 RETURN
D1  8030 IF C%=44 THEN 7900
B0  8040 ER%=7:RETURN
AB  8050 :
A1  8060 :
0A  8070 REM ******************
    ***********
01  8080 REM SUBROUTINE KEYWORD
06  8090 REM ******************
    ***********
F9  8100 :
B5  8110 IF SH% THEN ER%=24:RETU
    RN
07  8120 IF CD% THEN ER%=28:EF%=
    -1:RETURN
5B  8130 IP%=IP%+1:S$=L$(IP%):C%
    =ASC(S$):IF FNA(0)=0 OR C%=3
    4 THEN ER%=27:EF%=-1:RETURN
0B  8140 GOSUB 3960
A7  8150 IF ER%=0 THEN 8200
12  8160 UN$(UT%)=S$:UT%(UT%)=7
C3  8170 SH%=-1
32  8180 O%=KR%:DV=AD%:GOSUB5340
4A  8190 UT%=UT%+1:ER%=0:RETURN
81  8200 IF CV%<5 THEN ER%=27:EF
    %=-1:RETURN
69  8210 IF CV%=5 THEN UT%(AD%)=
    7:GOTO 8170
23  8220 ER%=23:FE%=-1:RETURN
7C  8230 :
6A  8240 :
A1  8250 REM ******************
    ***********
BC  8260 REM RETURN KEYWORD
BD  8270 REM ******************
    ***********
42  8280 :
C5  8290 IF SH%=0 THEN ER%=25:RE
    TURN
60  8300 OC$=OC$+CHR$(KR%)
1B  8310 RETURN
9A  8320 :
90  8330 :
1B  8340 REM ******************
    ***********
DC  8350 REM CALL KEYWORD
17  8360 REM ******************
    ***********
E8  8370 :
6A  8380 IP%=IP%+1:S$=L$(IP%):GO
    SUB 3920
08  8390 IF ER% THEN ER%=22:RETU
    RN
F5  8400 O%=KR%:DV=AD%:GOSUB5300
74  8410 RETURN
3E  8420 :
34  8430 :
A7  8440 REM ******************
    ***********
B4  8450 REM EXTERNAL KEYWORD
B2  8460 REM ******************
    ***********
0D  8470 :
52  8480 IF CD% THEN WR%=3
B8  8490 IP%=IP%+1:S$=L$(IP%):C%
    =ASC(S$)
1B  8500 IF C%=13 THEN RETURN
34  8510 IF C%=44 THEN 8490
C2  8520 IF FNA(0)=0 OR C%=34 TH
    EN ER%=27:RETURN
80  8530 GOSUB 3960
A2  8540 IF ER%=0 THEN ER%=23:RE
    TURN
D3  8550 ER%=0
6B  8560 UN$(UT%)=S$:UT%(UT%)=6
8A  8570 UT%=UT%+1
C1  8580 GOTO 8490
95  8590 :
83  8600 :
28  8610 REM ******************
    ***********
DE  8620 REM FORWARD KEYWORD
24  8630 REM ******************
    ***********
DB  8640 :
00  8650 IF CD% THEN WR%=3
56  8660 IP%=IP%+1:S$=L$(IP%):C%
    =ASC(S$)
65  8670 IF C%=13 THEN RETURN
7F  8680 IF C%=44 THEN 8660
64  8690 IF FNA(0)=0 OR C%=34 TH
    EN ER%=27:RETURN
BA  8700 GOSUB 3960
69  8710 IF ER%=0 THEN ER%=23:RE
    TURN
AE  8720 ER%=0
EF  8730 UN$(UT%)=S$:UT%(UT%)=5
B7  8740 UT%=UT%+1
F1  8750 GOTO 8660
60  8760 :
5E  8770 :
BD  8780 REM ******************
    ***********
5D  8790 REM CLS AND HALT KEYWOR
    DS
E9  8800 REM ******************
    ***********
B6  8810 :
C4  8820 IP%=IP%+1:IF ASC(L$(IP%
    ))<>13 THEN WR%=1
64  8830 OC$=OC$+CHR$(KR%)
24  8840 RETURN
8E  8850 :
84  8860 :
17  8870 REM ******************
    ***********
3A  8880 REM WAIT AND SYSCALL KE
    YWORDS
63  8890 REM ******************
    ***********
DC  8900 :
EE  8910 IP%=IP%+1:IF ASC(L$(IP%
    ))=13 THEN ER%=7:RETURN
A7  8920 GOSUB 4200:IF ER% THEN
    RETURN
CB  8930 IF CV%<>1 THEN ER%=15:R
    ETURN
85  8940 IF ASC(L$(IP%))<>13 THE
    N WR%=1
8C  8950 OC$=OC$+CHR$(KR%)
AD  8960 RETURN
17  8970 :
0D  8980 :
EE  8990 REM ******************
    ***********
50  9000 REM ******************
    ***********
CA  9010 REM BYTE,WORD & CHARIN
    FUNCTIONS
AC  9020 REM ******************
    ***********
53  9030 :
1D  9040 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
42  9050 IF CV%<>1 THEN ER%=15:R
    ETURN
09  9060 RETURN
AB  9070 :
E0  9080 REM ******************
    ***********
09  9090 REM LEN & ASCII FUNCTIO
    NS
FC  9100 REM ******************
    ***********
83  9110 :
CD  9120 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
55  9130 IF CV%<>2 THEN ER%=15:R
    ETURN
B0  9140 CV%=1
6F  9150 RETURN
D1  9160 :
CF  9170 :
0C  9180 REM ******************
    ***********
47  9190 REM CHAR & STR FUNCTION
7B  9200 REM ******************
    ***********
27  9210 :
2A  9220 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
FD  9230 IF CV%<>1 THEN ER%=15:R
    ETURN
90  9240 CV%=2
CB  9250 RETURN
6A  9260 :
60  9270 :
A1  9280 REM ******************
    **********
FB  9290 REM STOP, KEY, IOSTAT,D
    STAT
9D  9300 REM ******************
    **********
B8  9310 :
9E  9320 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
D9  9330 IF CV%<>1 THEN ER%=15:R
    ETURN
FF  9340 CV%=1
24  9350 RETURN
8E  9360 :
84  9370 :
17  9380 REM ******************
    ***********
7B  9390 REM LEFT & RIGHT FUNCTI
    ONS
63  9400 REM ******************
    ***********
DC  9410 :
72  9420 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
C0  9430 IF CV%<>2 THEN ER%=15:R
    ETURN
4F  9440 OC$=OC$+CHR$(14)
C4  9450 IF L$(IP%)<>"," THEN ER
    %=7:RETURN
FA  9460 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
6D  9470 IF CV%<>1 THEN ER%=15:R
    ETURN
3D  9480 OC$=OC$+CHR$(8)+CHR$(15
    )
93  9490 CV%=2
CF  9500 RETURN
71  9510 :
6F  9520 :
AC  9530 REM ******************
    ***********
B8  9540 REM MID FUNCTION
98  9550 REM ******************
    ***********
47  9560 :
71  9570 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
A1  9580 IF CV%<>2 THEN ER%=15:R
    ETURN
08  9590 OC$=OC$+CHR$(14)
FD  9600 IF L$(IP%)<>"," THEN ER
    %=7:RETURN
79  9610 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
26  9620 IF CV%<>1 THEN ER%=15:R
    ETURN
9F  9630 OC$=OC$+CHR$(2)
65  9640 IF L$(IP%)<>"," THEN ER
    %=7:RETURN
E1  9650 IP%=IP%+1:GOSUB 4200:IF
     ER% THEN RETURN
```

```
AE  9660 IF CV%<>1 THEN ER%=15:RETURN
61  9670 OC$=OC$+CHR$(9)+CHR$(3)+CHR$(8)+CHR$(15)
E9  9680 CV%=2
71  9690 RETURN
33  9700 :
29  9710 :
A2  9720 REM *******************************
0E  9730 REM SYSFN FUNCTION
59  9740 REM *******************************
06  9750 :
70  9760 IP%=IP%+1:GOSUB 4200:IF ER% THEN RETURN
DF  9770 IF CV%<>1 THEN ER%=15:RETURN
50  9780 OC$=OC$+CHR$(2)
42  9790 IF L$(IP%)<>"," THEN ER%=7:RETURN
B8  9800 IP%=IP%+1:GOSUB 4200:IF ER% THEN RETURN
AA  9810 IF CV%<>2 THEN ER%=15:RETURN
17  9820 OC$=OC$+CHR$(3)
80  9830 CV%=2
18  9840 RETURN
9A  9850 :
90  9860 :
1B  9870 REM *******************************
42  9880 REM DERR FUNCTION
17  9890 REM *******************************
E8  9900 :
0E  9910 IP%=IP%+1:GOSUB 4200:IF ER% THEN RETURN
69  9920 IF CV%<>1 THEN ER%=15:RETURN
EC  9930 CV%=2
74  9940 RETURN
3E  9950 :
34  9960 :
```

## CONSTRUCTING A COMPILER

Oops! Last month we forgot to give you the example programs for the series Constructing a Compiler - Here they are!

**PROGRAM: EXAMPLE 1**

```
10 ;
20 ; Example program 1
30 ;
40 ; Data Division
50 ;
60 var int pointer,count
70 var string filename,table array(10)
80 ;
90 forward inputdata,outputdata
100 ;
110 ; Procedure Division
120 ;
130 begin
140 pointer=0
150 inputdata
160 count=0
170 outputdata
180 end
190 ;
200 ; Subroutines
210 ;
220 subroutine inputdata
230 begin
240 loop while pointer<10
250 write "Enter element ";pointer;":";
260 read table(pointer)
270 pointer++
280 endloop
290 end
300 ;
310 subroutine outputdata
320 begin
330 write "Enter filename:";
340 read filename
350 fopen 5,filename for output
360 if iostat(0)=0
370 loop
380 write#5,table(count)
390 count++
400 endloop when count=10
410 else
420 write "Data file error!"
430 endif
440 fclose 5
450 end
```

## CONSTRUCTING A COMPILER

**PROGRAM: EXAMPLE 2**

```
10 ;
20 ; Example program 2
30 ;
40 ; Data Division
50 ;
60 var int pointer,fileerror
70 var string filename,table array(10),disk
80 ;
90 ; Subroutines
100 ;
110 subroutine getdata
120 begin
130 write "Enter filename:";
140 read filename
150 fopen 9,filename for input
170 loop
180 read#9,table(pointer)
181 if dstat(0)<>0
182 fileerror=1
183 else
190 pointer++
191 endif
200 endloop when pointer=10 or fileerror
250 fclose 9
260 end
270 ;
280 subroutine printdata
290 begin
300 loop while pointer<>10
310 write table(pointer)
320 pointer++
330 endloop
340 end
350 ;
360 ; Procedure Division
370 ;
380 begin
390 fileerror=0
400 pointer=0
401 disk=derr(0)
410 getdata
420 if fileerror=0
430 pointer=0
440 printdata
450 else
451 write "Data file error!"
```

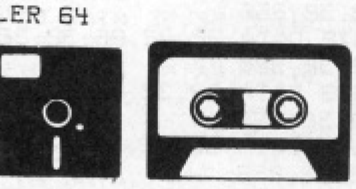
## MAKING MUSIC

**PROGRAM: SOUNDTRACK**

```
9E  1 REM:SOUNDTRACK
38  2 :
39  3 :
C9  10 B=0:C=0
BC  20 FORI=51456TO51520
73  25 READA:POKEI,A:B=B+A
E5  30 NEXTI
1E  35 IFB<>3871THENPRINT"[SE]RROR IN LINES 200-235:PLEASE CHECK.":STOP
EB  36 PRINT"[SB]LOCK 1 ENTERED CORRECTLY."
12  40 FORI=52944TO53198
DF  45 READA:POKEI,A:C=C+A
F9  50 NEXTI
10  55 IFC<>41571THENPRINT"[SE]RROR IN LINES 300 ONWARDS: PLEASE[SPC6]CHECK.":STOP
BA  60 PRINT"[SA]LL ENTERED CORRECTLY."
7E  65 POKE53281,7:POKE53280,9:PRINT"[CLR]";CHR$(14)
F9  70 V=54272:POKEV+24,15
1C  75 POKEV+12,9:POKEV+19,9
ED  80 FORI=0TO31:POKE49152+I,I:POKE51200+I,I:NEXT
EE  85 FORI=0TO31:POKE49183+I,(31-I):POKE51231+I,(31-I):NEXT
0C  86 POKE49215,255:POKE51263,255
9A  90 PRINT:PRINT"[BLACK,SN]OT VERY PRETTY, BUT IT WORKS!"
F7  95 SYS53176
1F  100 PRINT:PRINT"[SP,SO,SK,SE] $[SC,SF]0[SC] TO ALTER W/FORM FOR VOICE 2."
78  102 PRINT"[SP,SO,SK,SE] $[SC,SF]86 TO ALTER W/FORM FOR VOICE 3."
6B  104 PRINT"[SP,SO,SK,SE] $[SC,SE,SD]8 TO ALTER DELAY (CURRENTLY AT 12)."
EA  106 END
F5  200 DATA 004,073,004,139,004,208,005,025,005,103
14  205 DATA 005,185,006,016,006,108,006,206,007,053
A5  210 DATA 007,163,008,023,008
```

```
     ,147,009,021,009,159
B1  215 DATA 010,060,010,205,011
     ,114,012,032,012,216
F3  220 DATA 013,156,014,107,015
     ,070,016,047,017,037
13  225 DATA 018,042,019,063,020
     ,100,021,154,022,227
90  230 DATA 024,063,025,177,000
61  300 DATA 174,207,206,232,142
     ,207,206,224,012,240
52  305 DATA 004,076,049,234,234
     ,162,000,142,207,206
0F  310 DATA 174,206,206,234,234
     ,142,206,206,234,234
D9  315 DATA 234,076,128,207,234
     ,234,234,234,234,234
44  320 DATA 234,234,234,234,234
     ,234,000,024,174,255
51  325 DATA 206,172,254,206,169
     ,000,141,011,212,169
6F  330 DATA 033,141,011,212,185
     ,096,207,141,029,207
8B  335 DATA 185,097,207,141,030
     ,207,189,000,192,201
9D  340 DATA 255,240,029,010,170
     ,189,000,201,141,008
82  345 DATA 212,189,001,201,141
     ,007,212,174,255,206
5B  350 DATA 234,232,224,240,240
     ,019,142,255,206,076
05  355 DATA 049,234,162,000,142
     ,255,206,142,254,206
15  360 DATA 076,000,207,234,234
     ,172,254,206,200,200
9F  365 DATA 140,254,206,162,000
     ,142,255,206,076,049
E8  370 DATA 234,000,255,000,000
     ,192,240,192,224,193
ED  375 DATA 208,194,192,195,176
     ,196,160,197,144,198
52  380 DATA 255,255,255,255,255
     ,255,255,255,255,255
C0  385 DATA 255,255,255,255,255
     ,255,169,000,141,018
D1  390 DATA 212,169,033,141,018
     ,212,174,206,206,189
BF  395 DATA 000,200,201,255,240
     ,017,010,170,189,000
3C  400 DATA 201,141,015,212,189
     ,001,201,141,014,212
F9  405 DATA 076,174,207,162,000
     ,142,206,206,076,128
FF  410 DATA 207,234,174,206,206
     ,232,142,206,206,076
79  415 DATA 000,207,169,208,141
     ,020,003,169,206,141
45  420 DATA 021,003,169,000,141
     ,255,206,141,254,206
00  425 DATA 141,206,206,096,000
```

SAMPLER 64



PROGRAM: BOOT

```
4F  5 PRINT"[CLR]"
0B  10 POKE53280,0:POKE53281,0
9D  20 PRINT"THIS PROGRAM LINKS
    UP TO THE"
6C  30 PRINT"[DOWN]DATA READ PRO
    GRAMS. TO START"
36  40 PRINT"[DOWN]WITH THE PROG
    RAM RELOCATES THE BASIC"
93  50 PRINT"[DOWN]AREA SO THE P
    ROGRAM CAN BE POKED IN"
F8  60 PRINT"[DOWN]CORRECTLY INT
    O ITS CORRECT AREA"
49  70 PRINT"[DOWN]OF MEMORY AND
     THEN SAVED"
37  80 PRINT"[DOWN]PRESS ANY KEY
     TO LOAD"
BC  90 GETA$:IFA$=""THEN90
B3  100 PRINT"[CLR]POKE43,1:POKE
    44,64:POKE16384,0:NEW[DOWN2]
    "
86  110 PRINT"LOAD"+CHR$(34)+"DA
    TA1"+CHR$(34)+",8"
4A  120 PRINT"[DOWN4]RUN"
0B  130 POKE631,19:POKE632,13:PO
    KE633,13:POKE634,13:POKE198,
    4
```

SAMPLER 64

PROGRAM: DATA 1

```
D9  5 L=2049:CH=0
0B  10 POKE53280,0:POKE53281,0
5E  20 PRINT"[CLR]"
13  30 PRINT"DATA LOADER 1"
1A  40 PRINT"[HOME,DOWN2]POKE LO
    CATION:"L
61  50 FOR I=1 TO 8
9A  60 READ A
9A  65 IF A<0 THEN 120
F0  70 POKEL,A:CH=CH+A:L=L+1
D2  80 NEXT
4E  90 READ SUM
3D  100 IF SUM<>CHTHEN PRINT"CHE
    CKSUM ERROR IN LINE"PEEK(64)
    *256+PEEK(63):STOP
9A  110 CH=0:GOTO 40
2B  120 PRINT"[CLR]NEW[DOWN3]LOA
    D"+CHR$(34)+"DATA2"+CHR$(34)
    +",8[DOWN5]RUN"
0B  130 POKE631,19:POKE632,13:PO
    KE633,13:POKE634,13:POKE198,
    4
65  500 DATA 62,8,10,0,158,50,49
    ,49,386
06  501 DATA 50,58,143,34,20,20,
    20,20,365
2B  502 DATA 20,20,20,20,20,20,2
    0,20,160
08  503 DATA 20,20,20,83,79,85,7
    8,68,453
EC  504 DATA 32,83,65,77,80,76,6
    9,82,564
F5  505 DATA 32,66,89,32,83,84,6
    9,80,535
D7  506 DATA 72,69,78,32,84,72,7
    9,77,563
96  507 DATA 32,39,56,56,0,0,0,1
    69,352
5D  508 DATA 0,141,32,208,141,33
    ,208,169,932
0C  509 DATA 1,141,134,2,169,8,3
    2,210,697
E1  510 DATA 255,160,0,169,224,1
    33,251,169,1361
9C  511 DATA 8,133,252,169,0,133
    ,253,169,1117
5B  512 DATA 208,133,254,120,169
    ,52,133,1,1070
03  513 DATA 177,251,145,253,200
    ,208,249,230,1713
0A  514 DATA 254,230,252,165,254
    ,201,249,208,1813
2E  515 DATA 239,169,55,133,1,88
    ,160,0,845
A0  516 DATA 185,143,8,153,60,3,
    200,192,944
C1  517 DATA 80,208,245,76,60,3,
    234,234,1140
39  518 DATA 234,160,0,169,0,133
    ,251,169,1116
D1  519 DATA 50,133,252,169,1,13
    3,253,169,1160
BA  520 DATA 8,133,254,177,251,1
    45,253,200,1421
67  521 DATA 208,249,230,252,230
    ,254,165,254,1842
9F  522 DATA 201,12,208,239,169,
    0,133,251,1213
30  523 DATA 169,12,133,252,160,
    0,169,0,895
0E  524 DATA 145,251,200,208,249
    ,230,252,165,1700
63  525 DATA 252,201,208,208,241
    ,32,99,166,1407
11  526 DATA 32,142,166,169,0,13
    3,157,76,875
D4  527 DATA 174,167,0,0,0,0,0,3
    2,373
CE  528 DATA 32,32,32,32,32,32,3
    2,32,256
C9  529 DATA 32,32,32,32,32,32,3
    2,32,256
CC  530 DATA 32,32,32,32,32,32,3
    2,32,256
27  531 DATA 32,32,32,32,32,32,3
    2,32,256
CA  532 DATA 32,32,32,32,32,32,3
    2,32,256
95  533 DATA 32,32,32,32,32,32,3
    2,32,256
C4  534 DATA 32,32,32,32,32,80,3
    2,79,351
58  535 DATA 106,119,106,32,106,
    119,116,66,770
76  536 DATA 32,32,32,32,32,32,3
    2,32,256
F1  537 DATA 32,32,32,32,32,32,3
    2,32,256
F4  538 DATA 32,32,32,32,32,32,3
    2,32,256
3C  539 DATA 32,32,96,32,32,106,
    64,116,510
54  540 DATA 106,64,106,32,106,1
    11,116,66,707
5D  541 DATA 32,32,32,32,32,32,3
    2,32,256
10  542 DATA 32,32,32,32,32,32,3
    2,32,256
4B  543 DATA 32,32,32,32,32,32,3
    2,32,256
40  544 DATA 32,32,32,96,32,122,
    32,76,454
D6  545 DATA 106,111,106,111,106
    ,32,32,46,650
5C  546 DATA 32,32,32,32,32,32,3
    2,32,256
4B  547 DATA 32,32,32,32,32,32,3
    2,100,324
FD  548 DATA 100,100,100,100,100
    ,100,100,100,800
FC  549 DATA 100,100,100,100,100
    ,100,100,100,800
F3  550 DATA 100,100,100,100,100
    ,100,100,100,800
F2  551 DATA 100,100,100,100,100
    ,100,100,100,800
B9  552 DATA 100,100,100,100,100
    ,100,100,32,732
81  553 DATA 32,32,32,32,32,32,3
    2,32,256
84  554 DATA 32,32,32,32,32,32,3
    2,32,256
5F  555 DATA 32,32,32,32,32,32,3
    2,32,256
02  556 DATA 32,32,32,32,32,32,3
    2,32,256
```

```
6D  557 DATA 32,32,32,32,32,32,3
    2,32,256
A0  558 DATA 32,32,32,32,32,32,3
    2,32,256
7D  559 DATA 32,32,96,32,9,14,19
    ,20,254
3F  560 DATA 18,21,3,20,9,15,14,
    19,119
69  561 DATA 32,32,32,32,32,32,3
    2,32,256
90  562 DATA 32,32,32,32,32,32,3
    2,100,324
BE  563 DATA 100,100,100,100,100
    ,100,100,100,800
BD  564 DATA 100,100,100,100,100
    ,100,100,100,800
8C  565 DATA 100,100,100,100,100
    ,100,100,100,800
03  566 DATA 100,100,100,100,100
    ,100,100,100,800
AC  567 DATA 100,100,100,100,100
    ,100,100,32,732
96  568 DATA 32,32,32,32,32,32,3
    2,32,256
11  569 DATA 32,32,32,32,32,32,3
    2,32,256
14  570 DATA 32,32,32,32,32,32,3
    2,32,256
6F  571 DATA 32,32,32,32,32,32,3
    2,32,256
92  572 DATA 32,32,32,32,32,32,3
    2,32,256
E6  573 DATA 9,14,32,20,8,5,32,6
    ,126
F2  574 DATA 9,18,19,20,32,13,5,
    14,130
54  575 DATA 21,32,20,8,5,18,5,3
    2,141
88  576 DATA 1,18,5,32,19,9,24,3
    2,140
03  577 DATA 15,16,20,9,15,14,19
    ,32,140
7C  578 DATA 32,32,32,32,32,32,3
    2,32,256
17  579 DATA 32,32,32,32,32,32,3
    2,32,256
7A  580 DATA 32,32,32,32,32,32,3
    2,32,256
45  581 DATA 32,32,32,32,32,32,3
    2,32,256
7A  582 DATA 32,32,32,32,32,32,3
    2,20,244
16  583 DATA 15,32,21,19,5,32,20
    ,8,152
27  584 DATA 5,19,5,32,1,18,5,32
    ,117
85  585 DATA 3,21,5,32,20,1,16,5
    ,103
91  586 DATA 44,19,1,13,16,12,5,
    32,142
73  587 DATA 40,12,41,44,32,32,3
    2,32,265
22  588 DATA 32,32,32,32,32,32,3
    2,32,256
7F  589 DATA 32,32,96,32,32,32,3
    2,32,320
40  590 DATA 32,32,32,32,32,32,3
    2,32,256
3B  591 DATA 32,32,32,32,32,32,3
    2,32,256
0D  592 DATA 32,32,32,32,32,32,3
    2,19,243
57  593 DATA 1,13,16,12,5,32,40,
    19,138
B8  594 DATA 41,44,16,12,1,25,32
    ,2,173
D3  595 DATA 1,3,11,44,13,5,14,2
    1,112
E6  596 DATA 32,50,44,5,24,9,20,
    46,230
37  597 DATA 32,20,8,5,32,32,32,
    32,193
08  598 DATA 32,32,32,32,32,32,3
    2,32,256
03  599 DATA 32,32,32,32,32,32,3
    2,32,256
B6  600 DATA 32,32,32,32,32,32,3
    2,32,256
31  601 DATA 32,32,32,32,32,32,3
    2,32,256
6C  602 DATA 32,32,32,32,32,32,3
    2,5,229
16  603 DATA 24,9,20,32,15,16,20
    ,9,145
F3  604 DATA 15,14,32,14,5,5,4,1
    9,108
B4  605 DATA 32,14,15,32,4,5,19,
    3,124
C2  606 DATA 18,9,16,20,9,15,14,
    46,147
4D  607 DATA 32,20,8,5,32,32,32,
    32,193
9E  608 DATA 32,32,32,32,32,32,3
    2,32,256
99  609 DATA 32,32,32,32,32,32,3
    2,32,256
9C  610 DATA 32,32,32,32,32,32,3
    2,32,256
37  611 DATA 32,32,32,32,32,32,3
    2,32,256
71  612 DATA 32,32,32,32,32,32,3
    2,18,242
58  613 DATA 5,19,20,32,1,18,5,3
    2,132
F5  614 DATA 4,5,19,3,18,9,2,5,6
    5
61  615 DATA 4,32,2,5,12,15,23,4
    6,139
46  616 DATA 32,32,32,32,32,32,3
    2,32,256
C1  617 DATA 32,32,32,32,32,32,3
    2,32,256
C4  618 DATA 32,32,32,32,32,32,3
    2,32,256
9F  619 DATA 32,32,32,32,32,32,3
    2,32,256
42  620 DATA 32,32,32,32,32,32,3
    2,32,256
AD  621 DATA 32,32,32,32,32,32,3
    2,32,256
E0  622 DATA 32,32,32,32,32,32,3
    2,32,256
92  623 DATA 32,32,3,21,5,32,20,
    1,146
69  624 DATA 16,5,58,45,5,14,20,
    5,168
74  625 DATA 18,32,20,1,16,5,32,
    9,133
92  626 DATA 14,32,4,5,3,11,32,6
    ,107
B3  627 DATA 15,12,12,15,23,32,3
    2,32,173
AA  628 DATA 32,32,32,32,32,32,3
    2,32,256
75  629 DATA 32,32,32,32,32,32,3
    2,32,256
A8  630 DATA 32,32,32,32,32,32,3
    2,32,256
A3  631 DATA 32,32,32,32,32,32,3
    2,32,256
D6  632 DATA 32,32,32,32,32,32,3
    2,32,256
D8  633 DATA 32,32,20,8,5,32,4,9
    ,142
D0  634 DATA 18,5,3,20,9,15,14,1
    9,103
30  635 DATA 46,32,23,8,5,14,32,
    6,166
7A  636 DATA 9,14,14,9,19,8,5,4,
    82
A1  637 DATA 32,16,18,5,19,19,32
    ,32,173
70  638 DATA 32,32,32,32,32,32,3
    2,32,256
AB  639 DATA 32,32,32,32,32,32,3
    2,32,256
BE  640 DATA 32,32,32,32,32,32,3
    2,32,256
B9  641 DATA 32,32,32,32,32,32,3
    2,32,256
BC  642 DATA 32,32,32,32,32,32,3
    2,32,256
DE  643 DATA 32,32,20,8,5,32,19,
    16,164
53  644 DATA 1,3,5,32,2,1,18,32,
    94
27  645 DATA 20,15,32,5,24,9,20,
    32,157
93  646 DATA 2,1,3,11,32,20,15,3
    2,116
89  647 DATA 13,5,14,21,32,32,32
    ,32,181
66  648 DATA 32,32,32,32,32,32,3
    2,32,256
E1  649 DATA 32,32,32,32,32,32,3
    2,32,256
E4  650 DATA 32,32,32,32,32,32,3
    2,32,256
BF  651 DATA 32,32,32,32,32,32,3
    2,32,256
AC  652 DATA 32,32,32,32,32,32,3
    2,255,479
2A  653 DATA 255,255,255,255,255
    ,255,255,255,2040
8D  654 DATA 255,255,255,255,255
    ,255,255,41,1826
38  655 DATA 42,43,44,45,46,47,4
    8,32,347
DE  656 DATA 19,1,13,16,12,5,32,
    40,138
23  657 DATA 12,41,58,45,13,1,11
    ,5,186
CB  658 DATA 19,32,1,32,12,15,14
    ,7,132
CA  659 DATA 32,19,1,13,16,12,5,
    32,130
0A  660 DATA 15,6,32,1,32,32,32,
    32,182
D6  661 DATA 99,99,99,99,99,99,9
    9,99,792
7B  662 DATA 99,99,32,32,32,32,3
    2,32,390
43  663 DATA 32,32,32,32,32,32,3
    2,32,256
F6  664 DATA 32,32,32,32,32,32,3
    2,32,256
71  665 DATA 32,32,32,32,32,32,3
    2,32,256
69  666 DATA 19,15,21,14,4,32,1,
    16,122
44  667 DATA 16,18,15,24,32,49,4
    8,32,234
FE  668 DATA 19,5,3,19,46,32,9,2
    0,153
0D  669 DATA 32,3,1,14,32,14,15,
    20,131
00  670 DATA 32,8,1,22,5,32,32,3
    2,164
CB  671 DATA 32,32,32,32,32,32,3
    2,32,256
0E  672 DATA 32,32,96,32,32,32,3
    2,32,320
D9  673 DATA 32,32,32,32,32,32,3
    2,32,256
DC  674 DATA 32,32,32,32,32,32,3
    2,32,256
77  675 DATA 32,32,32,32,32,32,3
    2,32,256
27  676 DATA 9,20,19,32,16,12,1,
    25,134
58  677 DATA 2,1,3,11,32,19,16,5
    ,89
41  678 DATA 5,4,32,1,12,20,5,18
    ,97
50  679 DATA 5,4,46,32,32,32,32,
    32,215
86  680 DATA 32,32,32,32,32,32,3
    2,32,256
01  681 DATA 32,32,32,32,32,32,3
```

```
04
DF
82
ED
C4
D6
5C
A5
2F
B0
31
B5
E8
E3
89
BE
D5
6D
C7
FD
B0
EB
FE
F9
17
9F
61
B8
20
BC
A6
21
24
FF
2D
5A
89
64
D7
89
BC
```

```
   2,32,256
04 682 DATA 32,32,32,32,32,32,3
   2,32,256
DF 683 DATA 32,32,32,32,32,32,3
   2,32,256
82 684 DATA 32,32,32,32,32,32,3
   2,32,256
ED 685 DATA 32,32,32,32,32,32,3
   2,32,256
C4 686 DATA 19,1,13,16,12,5,32,
   40,138
D6 687 DATA 19,41,58,45,13,1,11
   ,5,193
5C 688 DATA 19,32,1,32,19,8,15,
   18,144
A5 689 DATA 20,32,19,1,13,16,12
   ,5,118
2F 690 DATA 32,23,8,9,3,8,32,32
   ,147
80 691 DATA 99,99,99,99,99,99,9
   9,99,792
31 692 DATA 99,99,32,32,32,32,3
   2,32,390
B5 693 DATA 32,32,32,32,32,32,3
   2,32,256
E8 694 DATA 32,32,32,32,32,32,3
   2,32,256
E3 695 DATA 32,32,32,32,32,32,3
   2,32,256
89 696 DATA 3,1,14,32,8,1,22,5,
   86
BE 697 DATA 32,19,16,5,5,4,32,1
   5,128
D5 698 DATA 6,32,16,12,1,25,2,1
   ,95
6D 699 DATA 3,11,32,1,12,20,5,1
   8,102
C7 700 DATA 5,4,46,32,32,32,32,
   32,215
FD 701 DATA 32,32,32,32,32,32,3
   2,32,256
B0 702 DATA 32,32,32,32,32,32,3
   2,32,256
EB 703 DATA 32,32,32,32,32,32,3
   2,32,256
FE 704 DATA 32,32,32,32,32,32,3
   2,32,256
F9 705 DATA 32,32,32,32,32,32,3
   2,32,256
17 706 DATA 16,12,1,25,2,1,3,11
   ,71
9F 707 DATA 58,45,16,12,1,25,19
   ,32,208
61 708 DATA 3,21,18,18,5,14,20,
   32,131
B8 709 DATA 19,1,13,16,12,5,32,
   9,107
20 710 DATA 14,32,20,8,5,32,32,
   32,175
BC 711 DATA 99,99,99,99,99,99,9
   9,99,792
A6 712 DATA 32,32,32,32,32,32,3
   2,32,256
21 713 DATA 32,32,32,32,32,32,3
   2,32,256
24 714 DATA 32,32,32,32,32,32,3
   2,32,256
FF 715 DATA 32,32,32,32,32,32,3
   2,32,256
2D 716 DATA 13,5,13,15,18,25,46
   ,32,167
5A 717 DATA 9,6,32,14,15,14,5,3
   2,127
89 718 DATA 16,18,5,19,5,14,20,
   32,129
64 719 DATA 20,8,5,14,32,9,20,3
   2,140
D7 720 DATA 18,5,20,21,18,14,19
   ,32,147
89 721 DATA 32,32,32,32,32,32,3
   2,32,256
8C 722 DATA 32,32,32,32,32,32,3
   2,32,256
E7 723 DATA 32,32,32,32,32,32,3
   2,32,256
8A 724 DATA 32,32,32,32,32,32,3
   2,32,256
55 725 DATA 32,32,32,32,32,32,3
   2,32,256
EA 726 DATA 20,15,32,20,8,5,32,
   13,145
C0 727 DATA 5,14,21,46,32,32,32
   ,32,214
36 728 DATA 32,32,32,32,32,32,3
   2,32,256
B1 729 DATA 32,32,32,32,32,32,3
   2,32,256
B4 730 DATA 32,32,32,32,32,32,3
   2,32,256
8F 731 DATA 32,32,32,32,32,32,3
   2,32,256
32 732 DATA 32,32,32,32,32,32,3
   2,32,256
1D 733 DATA 32,32,32,32,32,32,3
   2,32,256
D0 734 DATA 32,32,32,32,32,32,3
   2,32,256
0B 735 DATA 32,32,32,32,32,32,3
   2,32,256
4F 736 DATA 13,5,14,21,32,50,58
   ,45,238
99 737 DATA 20,1,11,5,19,32,25,
   15,128
B2 738 DATA 21,32,20,15,32,20,8
   ,5,153
EC 739 DATA 32,19,5,3,15,14,4,3
   2,124
2E 740 DATA 13,5,14,21,32,32,32
   ,32,181
8F 741 DATA 99,99,99,99,99,99,3
   2,32,658
18 742 DATA 32,32,32,32,32,32,3
   2,32,256
13 743 DATA 32,32,32,32,32,32,3
   2,32,256
C6 744 DATA 32,32,32,32,32,32,3
   2,32,256
41 745 DATA 32,32,32,32,32,32,3
   2,32,256
F6 746 DATA 23,8,9,3,8,32,3,15,
   101
38 747 DATA 14,20,1,9,14,19,32,
   19,128
C0 748 DATA 15,13,5,32,5,6,6,5,
   87
D1 749 DATA 3,20,19,32,1,14,4,3
   2,125
75 750 DATA 21,20,9,12,19,46,32
   ,32,191
5B 751 DATA 32,32,32,32,32,32,3
   2,32,256
2E 752 DATA 32,32,32,32,32,32,3
   2,32,256
29 753 DATA 32,32,32,32,32,32,3
   2,32,256
2C 754 DATA 32,32,32,32,32,32,3
   2,32,256
01 755 DATA 32,32,32,32,32,32,3
   2,61,285
21 756 DATA 61,61,61,61,61,61,6
   1,61,488
B0 757 DATA 61,61,61,61,61,61,6
   1,61,488
1F 758 DATA 61,61,61,61,61,61,6
   1,61,488
1E 759 DATA 61,61,61,61,61,61,6
   1,61,488
01 760 DATA 61,61,61,61,61,61,6
   1,32,459
D1 761 DATA 32,32,32,32,32,32,3
   2,32,256
D4 762 DATA 32,32,32,32,32,32,3
   2,32,256
2F 763 DATA 32,32,32,32,32,32,3
   2,32,256
52 764 DATA 32,32,32,32,32,32,3
   2,32,256
3D 765 DATA 32,32,32,32,32,32,3
   2,32,256
8E 766 DATA 32,32,16,18,5,19,19
   ,32,173
F2 767 DATA 19,16,1,3,5,32,20,1
   5,111
FD 768 DATA 32,3,15,14,20,32,15
   ,18,149
08 769 DATA 32,18,47,19,32,20,1
   5,32,215
27 770 DATA 17,21,9,20,32,32,32
   ,32,195
3A 771 DATA 32,32,32,32,32,32,3
   2,32,256
05 772 DATA 32,32,32,32,32,32,3
   2,32,256
38 773 DATA 32,32,32,32,32,32,3
   2,32,256
33 774 DATA 32,32,32,32,32,32,3
   2,32,256
E6 775 DATA 32,32,32,32,32,32,3
   2,32,256
61 776 DATA 32,32,32,32,32,32,3
   2,32,256
64 777 DATA 32,32,32,32,32,32,3
   2,32,256
3F 778 DATA 32,32,32,32,32,32,3
   2,32,256
E2 779 DATA 32,32,32,32,32,32,3
   2,32,256
8F 780 DATA 32,32,32,32,32,32,3
   2,255,479
35 781 DATA 255,255,255,255,255
   ,255,255,255,2040
76 782 DATA 255,255,255,255,255
   ,255,255,41,1826
1D 783 DATA 42,43,44,45,46,47,4
   8,32,347
A1 784 DATA 16,12,1,25,32,19,1,
   13,119
6F 785 DATA 16,12,5,32,9,14,32,
   18,138
E9 786 DATA 5,22,5,18,19,5,58,4
   5,177
73 787 DATA 20,8,9,19,32,16,12,
   1,117
08 788 DATA 25,19,32,32,32,32,3
   2,32,236
3F 789 DATA 99,99,99,99,99,99,9
   9,99,792
8C 790 DATA 99,99,99,99,99,99,9
   9,99,792
82 791 DATA 99,99,99,99,99,99,3
   2,32,658
F1 792 DATA 32,32,32,32,32,32,3
   2,32,256
F4 793 DATA 32,32,32,32,32,32,3
   2,32,256
72 794 DATA 20,8,5,32,19,1,13,1
   6,114
84 795 DATA 12,5,32,2,1,3,11,23
   ,89
98 796 DATA 1,18,4,46,32,9,20,3
   2,162
9E 797 DATA 23,15,18,11,19,32,2
   3,9,150
64 798 DATA 20,8,32,32,32,32,32
   ,32,220
5E 799 DATA 32,32,32,32,32,32,3
   2,32,256
59 800 DATA 32,32,32,32,32,32,3
   2,32,256
5C 801 DATA 32,32,32,32,32,32,3
   2,32,256
F7 802 DATA 32,32,32,32,32,32,3
   2,32,256
5A 803 DATA 32,32,32,32,32,32,3
   2,32,256
FD 804 DATA 2,15,20,8,32,12,15,
```

```
   14,118
BB 805 DATA 7,32,1,14,4,32,19,8
   ,117
76 806 DATA 15,18,20,32,19,1,13
   ,16,134
28 807 DATA 12,5,19,46,32,32,32
   ,32,210
81 808 DATA 32,32,32,32,32,32,3
   2,32,256
84 809 DATA 32,32,32,32,32,32,3
   2,32,256
5F 810 DATA 32,32,32,32,32,32,3
   2,32,256
02 811 DATA 32,32,32,32,32,32,3
   2,32,256
6D 812 DATA 32,32,32,32,32,32,3
   2,32,256
A0 813 DATA 32,32,32,32,32,32,3
   2,32,256
E1 814 DATA 3,8,1,14,7,5,32,19,
   89
05 815 DATA 16,5,5,4,58,45,1,12
   ,146
C8 816 DATA 20,5,18,19,32,20,8,
   5,127
61 817 DATA 32,19,16,5,5,4,32,1
   5,128
1B 818 DATA 6,32,20,8,5,32,32,3
   2,167
61 819 DATA 99,99,99,99,99,99,9
   9,99,792
77 820 DATA 99,99,99,99,32,32,3
   2,32,524
68 821 DATA 32,32,32,32,32,32,3
   2,32,256
63 822 DATA 32,32,32,32,32,32,3
   2,32,256
96 823 DATA 32,32,32,32,32,32,3
   2,32,256
3D 824 DATA 19,8,15,18,20,32,19
   ,1,132
AF 825 DATA 13,16,12,5,19,32,16
   ,12,125
FA 826 DATA 1,25,2,1,3,11,32,18
   ,93
09 827 DATA 1,20,5,32,16,18,5,1
   9,116
4E 828 DATA 19,32,20,8,5,32,32,
   32,180
30 829 DATA 32,32,32,32,32,32,3
   2,32,256
6B 830 DATA 32,32,32,32,32,32,3
   2,32,256
7E 831 DATA 32,32,32,32,32,32,3
   2,32,256
79 832 DATA 32,32,32,32,32,32,3
   2,32,256
7C 833 DATA 32,32,32,32,32,32,3
   2,32,256
83 834 DATA 43,32,20,15,32,9,14
   ,3,168
A2 835 DATA 18,5,1,19,5,32,1,14
   ,95
B1 836 DATA 4,32,45,32,20,15,32
   ,4,184
DC 837 DATA 5,3,18,5,1,19,5,46,
   102
73 838 DATA 32,32,32,32,32,32,3
   2,32,256
26 839 DATA 32,32,32,32,32,32,3
   2,32,256
A1 840 DATA 32,32,32,32,32,32,3
   2,32,256
A4 841 DATA 32,32,32,32,32,32,3
   2,32,256
7F 842 DATA 32,32,32,32,32,32,3
   2,32,256
22 843 DATA 32,32,32,32,32,32,3
   2,32,256
37 844 DATA 13,1,14,21,1,12,32,
   16,110
42 845 DATA 12,1,25,58,45,4,9,6
   ,160
94 846 DATA 6,5,18,5,14,20,32,1
   1,111
BF 847 DATA 5,25,19,32,16,12,1,
   25,135
83 848 DATA 32,20,8,5,32,32,32,
   32,193
13 849 DATA 99,99,99,99,99,99,9
   9,99,792
17 850 DATA 99,99,99,32,32,32,3
   2,32,457
0A 851 DATA 32,32,32,32,32,32,3
   2,32,256
D5 852 DATA 32,32,32,32,32,32,3
   2,32,256
08 853 DATA 32,32,32,32,32,32,3
   2,32,256
37 854 DATA 19,8,15,18,20,32,19
   ,1,132
5B 855 DATA 13,16,12,5,32,2,1,3
   ,84
6E 856 DATA 11,23,1,18,4,32,15,
   18,122
6B 857 DATA 32,6,15,18,23,1,18,
   4,117
13 858 DATA 32,1,20,32,32,32,32
   ,32,213
B2 859 DATA 32,32,32,32,32,32,3
   2,32,256
9D 860 DATA 32,32,32,32,32,32,3
   2,32,256
50 861 DATA 32,32,32,32,32,32,3
   2,32,256
8B 862 DATA 32,32,32,32,32,32,3
   2,32,256
9E 863 DATA 32,32,32,32,32,32,3
   2,32,256
9C 864 DATA 4,9,6,6,5,18,5,14,6
   7
A2 865 DATA 20,32,19,16,5,5,4,1
   9,120
9E 866 DATA 46,32,32,32,32,32,3
   2,32,270
9A 867 DATA 32,32,32,32,32,32,3
   2,32,256
65 868 DATA 32,32,32,32,32,32,3
   2,32,256
98 869 DATA 32,32,32,32,32,32,3
   2,32,256
93 870 DATA 32,32,32,32,32,32,3
   2,32,256
46 871 DATA 32,32,32,32,32,32,3
   2,32,256
C1 872 DATA 32,32,32,32,32,32,3
   2,32,256
C4 873 DATA 32,32,32,32,32,32,3
   2,32,256
C8 874 DATA 3,18,15,16,32,19,1,
   13,117
30 875 DATA 16,12,5,58,45,18,5,
   6,165
D0 876 DATA 9,14,5,32,20,8,5,32
   ,125
8D 877 DATA 19,1,13,16,12,5,46,
   32,144
E1 878 DATA 16,18,5,19,19,32,32
   ,32,173
65 879 DATA 99,99,99,99,99,99,9
   9,99,792
59 880 DATA 99,99,99,32,32,32,3
   2,32,457
AC 881 DATA 32,32,32,32,32,32,3
   2,32,256
87 882 DATA 32,32,32,32,32,32,3
   2,32,256
AA 883 DATA 32,32,32,32,32,32,3
   2,32,256
2B 884 DATA 20,8,5,32,3,20,18,1
   2,118
E6 885 DATA 32,11,5,25,32,20,15
   ,32,172
F3 886 DATA 13,1,18,11,32,20,8,
   5,108
D0 887 DATA 32,19,20,1,18,20,32
   ,1,143
03 888 DATA 14,4,32,20,8,5,32,3
   2,147
54 889 DATA 32,32,32,32,32,32,3
   2,32,256
AF 890 DATA 32,32,32,32,32,32,3
   2,32,256
D2 891 DATA 32,32,32,32,32,32,3
   2,32,256
BD 892 DATA 32,32,32,32,32,32,3
   2,32,256
70 893 DATA 32,32,32,32,32,32,3
   2,32,256
72 894 DATA 19,16,1,3,5,32,20,1
   5,111
26 895 DATA 32,13,1,18,11,32,20
   ,8,135
4A 896 DATA 5,32,5,14,4,46,32,3
   2,170
BC 897 DATA 32,32,32,32,32,32,3
   2,32,256
57 898 DATA 32,32,32,32,32,32,3
   2,32,256
BA 899 DATA 32,32,32,32,32,32,3
   2,32,256
B5 900 DATA 32,32,32,32,32,32,3
   2,32,256
B8 901 DATA 32,32,32,32,32,32,3
   2,32,256
B3 902 DATA 32,32,32,32,32,32,3
   2,32,256
66 903 DATA 32,32,32,32,32,32,3
   2,32,256
E5 904 DATA 32,32,16,18,5,19,19
   ,32,173
03 905 DATA 19,16,1,3,5,32,15,1
   8,109
51 906 DATA 32,18,47,19,32,20,1
   5,32,215
2C 907 DATA 17,21,9,20,32,20,15
   ,32,166
5A 908 DATA 13,5,14,21,32,32,32
   ,255,404
B5 909 DATA 255,255,255,255,255
   ,255,255,255,2040
F6 910 DATA 255,255,255,255,255
   ,255,255,41,1826
9D 911 DATA 42,43,44,45,46,47,4
   8,32,347
21 912 DATA 11,9,12,12,32,19,1,
   13,109
72 913 DATA 16,12,5,58,45,5,18,
   1,160
FD 914 DATA 19,5,19,32,20,8,5,3
   2,140
B1 915 DATA 19,1,13,16,12,5,32,
   23,121
F6 916 DATA 8,9,3,8,32,32,32,32
   ,156
BF 917 DATA 99,99,99,99,99,99,9
   9,99,792
1B 918 DATA 99,99,99,32,32,32,3
   2,32,457
F6 919 DATA 32,32,32,32,32,32,3
   2,32,256
71 920 DATA 32,32,32,32,32,32,3
   2,32,256
74 921 DATA 32,32,32,32,32,32,3
   2,32,256
DF 922 DATA 9,19,32,3,21,18,18,
   5,125
70 923 DATA 14,20,12,25,32,9,14
   ,32,158
7E 924 DATA 20,8,5,32,3,15,13,1
   6,112
47 925 DATA 21,20,5,18,19,32,13
   ,5,133
79 926 DATA 13,15,18,25,46,32,3
   2,32,213
DE 927 DATA 32,32,32,32,32,32,3
   2,32,256
D9 928 DATA 32,32,32,32,32,32,3
   2,32,256
```

```
DC  929 DATA 32,32,32,32,32,32,3
    2,32,256
77  930 DATA 32,32,32,32,32,32,3
    2,32,256
4A  931 DATA 32,32,32,32,32,32,3
    2,99,323
A6  932 DATA 99,99,99,99,99,99,9
    9,99,792
8F  933 DATA 99,99,99,99,99,99,9
    9,99,792
1C  934 DATA 99,99,99,99,99,99,9
    9,99,792
9D  935 DATA 99,99,99,99,99,99,9
    9,99,792
4D  936 DATA 99,99,99,99,99,99,9
    9,32,725
04  937 DATA 32,32,32,32,32,32,3
    2,32,256
DF  938 DATA 32,32,32,32,32,32,3
    2,32,256
82  939 DATA 32,32,32,32,32,32,3
    2,32,256
ED  940 DATA 32,32,32,32,32,32,3
    2,32,256
20  941 DATA 32,32,32,32,32,32,3
    2,32,256
1B  942 DATA 32,32,32,32,32,32,3
    2,32,256
6E  943 DATA 32,32,19,15,21,14,4
    ,32,169
E8  944 DATA 19,1,13,16,12,5,18,
    32,116
E4  945 DATA 2,25,32,32,32,32,32
    ,32,219
C7  946 DATA 32,32,32,32,32,32,3
    2,32,256
EA  947 DATA 32,32,32,32,32,32,3
    2,32,256
B5  948 DATA 32,32,32,32,32,32,3
    2,32,256
E8  949 DATA 32,32,32,32,32,32,3
    2,32,256
E3  950 DATA 32,32,32,32,32,32,3
    2,32,256
16  951 DATA 32,32,32,32,32,32,3
    2,32,256
91  952 DATA 32,32,32,32,32,32,3
    2,32,256
B4  953 DATA 32,32,32,32,19,20,5
    ,16,188
20  954 DATA 8,5,14,32,20,8,15,1
    3,115
12  955 DATA 32,32,32,32,32,32,3
    2,32,256
FD  956 DATA 32,32,32,32,32,32,3
    2,32,256
B0  957 DATA 32,32,32,32,32,32,3
    2,32,256
EB  958 DATA 32,32,32,32,32,32,3
    2,32,256
FE  959 DATA 32,32,32,32,32,32,3
    2,32,256
F9  960 DATA 32,32,32,32,32,32,3
    2,32,256
FC  961 DATA 32,32,32,32,32,32,3
    2,32,256
97  962 DATA 32,32,32,32,32,32,3
    2,32,256
FA  963 DATA 32,32,32,32,32,32,3
    2,32,256
90  964 DATA 49,57,56,56,32,32,3
    2,32,346
F8  965 DATA 32,32,32,32,32,32,3
    2,32,256
F3  966 DATA 32,32,32,32,32,32,3
    2,32,256
A6  967 DATA 32,32,32,32,32,32,3
    2,32,256
21  968 DATA 32,32,32,32,32,32,3
    2,32,256
24  969 DATA 32,32,32,32,32,32,3
    2,32,256
FF  970 DATA 32,32,32,32,32,32,3
    2,32,256
A2  971 DATA 32,32,32,32,32,32,3
    2,32,256
8D  972 DATA 32,32,32,32,32,32,3
    2,32,256
C0  973 DATA 32,32,32,32,32,32,3
    2,32,256
BB  974 DATA 32,32,32,32,32,32,3
    2,32,256
8E  975 DATA 32,32,32,32,32,32,3
    2,32,256
89  976 DATA 32,32,32,32,32,32,3
    2,32,256
8C  977 DATA 32,32,32,32,32,32,3
    2,32,256
E7  978 DATA 32,32,32,32,32,32,3
    2,32,256
8A  979 DATA 32,32,32,32,32,32,3
    2,32,256
55  980 DATA 32,32,32,32,32,32,3
    2,32,256
88  981 DATA 32,32,32,32,32,32,3
    2,32,256
83  982 DATA 32,32,32,32,32,32,3
    2,32,256
36  983 DATA 32,32,32,32,32,32,3
    2,32,256
B1  984 DATA 32,32,32,32,32,32,3
    2,32,256
B4  985 DATA 32,32,32,32,32,32,3
    2,32,256
8F  986 DATA 32,32,32,32,32,32,3
    2,32,256
4F  987 DATA 32,32,32,32,16,18,5
    ,19,186
6A  988 DATA 19,32,19,16,1,3,5,3
    2,127
C0  989 DATA 20,15,32,18,5,20,21
    ,18,149
1D  990 DATA 14,32,20,15,32,13,5
    ,14,145
DD  991 DATA -1
```

SAMPLER 64

PROGRAM: DATA 2

```
AA  5 L=5977:CH=0
0B  10 POKE53280,0:POKE53281,0
5E  20 PRINT"[CLR]"
14  30 PRINT"DATA LOADER 2"
1A  40 PRINT"[HOME,DOWN2]POKE LO
    CATION:"L
61  50 FOR I=1 TO 8
9A  60 READ A
9A  65 IF A<0 THEN 120
F0  70 POKEL,A:CH=CH+A:L=L+1
D2  80 NEXT
4E  90 READ SUM
3D  100 IF SUM<>CHTHEN PRINT"CHE
    CKSUM ERROR IN LINE"PEEK(64)
    *256+PEEK(63):STOP
9A  110 CH=0:GOTO 40
38  120 PRINT"[CLR]NEW[DOWN3]LOA
    D"+CHR$(34)+"DATA3"+CHR$(34)
    +",8[DOWN5]RUN"
0B  130 POKE631,19:POKE632,13:PO
    KE633,13:POKE634,13:POKE198,
    4
2B  500 DATA 21,32,32,32,32,32,3
    2,32,245
2A  501 DATA 32,32,32,32,32,32,3
    2,32,256
F5  502 DATA 32,32,32,32,32,32,3
    2,32,256
28  503 DATA 32,32,32,32,32,32,3
    2,32,256
23  504 DATA 32,32,32,32,32,32,3
    2,32,256
56  505 DATA 32,32,32,32,32,32,3
    2,32,256
D1  506 DATA 32,32,32,32,32,32,3
    2,32,256
D4  507 DATA 32,32,32,32,32,32,3
    2,32,256
2F  508 DATA 32,32,32,32,32,32,3
    2,32,256
52  509 DATA 32,32,32,32,32,32,3
    2,32,256
3D  510 DATA 32,32,32,32,32,32,3
    2,32,256
F0  511 DATA 32,32,32,32,32,32,3
    2,32,256
3E  512 DATA 32,32,32,32,32,32,3
    2,32,256
39  513 DATA 32,32,32,32,32,32,3
    2,32,256
3C  514 DATA 32,32,32,32,32,32,3
    2,32,256
D7  515 DATA 32,32,32,32,32,32,3
    2,32,256
3A  516 DATA 32,32,32,32,32,32,3
    2,32,256
05  517 DATA 32,32,32,32,32,32,3
    2,32,256
38  518 DATA 32,32,32,32,32,32,3
    2,32,256
33  519 DATA 32,32,32,32,32,32,3
    2,32,256
E6  520 DATA 32,32,32,32,32,32,3
    2,32,256
61  521 DATA 32,32,32,32,32,32,3
    2,32,256
64  522 DATA 32,32,32,32,32,32,3
    2,32,256
3F  523 DATA 32,32,32,32,32,32,3
    2,32,256
E2  524 DATA 32,32,32,32,32,32,3
    2,32,256
CD  525 DATA 32,32,32,32,32,32,3
    2,32,256
00  526 DATA 32,32,32,32,32,32,3
    2,32,256
FB  527 DATA 32,32,32,32,32,32,3
    2,32,256
CE  528 DATA 32,32,32,32,32,32,3
    2,32,256
C9  529 DATA 32,32,32,32,32,32,3
    2,32,256
CC  530 DATA 32,32,32,32,32,32,3
    2,32,256
27  531 DATA 32,32,32,32,32,32,3
    2,32,256
CA  532 DATA 32,32,32,32,32,32,3
    2,32,256
95  533 DATA 32,32,32,32,32,32,3
    2,32,256
C8  534 DATA 32,32,32,32,32,32,3
    2,32,256
C3  535 DATA 32,32,32,32,32,32,3
    2,32,256
76  536 DATA 32,32,32,32,32,32,3
    2,32,256
F1  537 DATA 32,32,32,32,32,32,3
    2,32,256
F4  538 DATA 32,32,32,32,32,32,3
    2,32,256
CF  539 DATA 32,32,32,32,32,32,3
    2,32,256
72  540 DATA 32,32,32,32,32,32,3
    2,32,256
5D  541 DATA 32,32,32,32,32,32,3
    2,32,256
10  542 DATA 32,32,32,32,32,32,3
    2,32,256
4B  543 DATA 32,32,32,32,32,32,3
    2,32,256
```

```
5E   544 DATA 32,32,32,32,32,32,3
     2,32,256
FF   545 DATA 32,32,32,32,32,32,3
     2,0,224
97   546 DATA 0,0,0,0,0,0,0,0,0
96   547 DATA 0,0,0,0,0,0,0,0,0
81   548 DATA 0,0,0,0,0,0,0,32,32
25   549 DATA 32,32,32,32,32,32,3
     2,32,256
58   550 DATA 32,32,32,32,32,32,3
     2,32,256
53   551 DATA 32,32,32,32,32,32,3
     2,32,256
06   552 DATA 32,32,32,32,32,32,3
     2,32,256
81   553 DATA 32,32,32,32,32,32,3
     2,32,256
84   554 DATA 32,32,32,32,32,32,3
     2,32,256
E6   555 DATA 32,32,106,119,119,1
     19,119,119,765
E3   556 DATA 119,119,119,119,119
     ,119,119,119,952
C5   557 DATA 119,119,116,32,32,3
     2,32,32,514
A0   558 DATA 32,32,32,32,32,32,3
     2,32,256
9B   559 DATA 32,32,32,32,32,32,3
     2,32,256
D7   560 DATA 32,32,106,32,19,15,
     21,14,271
22   561 DATA 4,32,19,1,13,16,12,
     5,102
9F   562 DATA 18,32,116,32,32,32,
     32,32,326
47   563 DATA 32,32,32,32,32,32,3
     2,32,256
6A   564 DATA 32,32,32,32,32,32,3
     2,32,256
72   565 DATA 32,32,106,111,32,45
     ,32,45,435
60   566 DATA 32,45,32,45,32,45,3
     2,45,308
83   567 DATA 32,111,116,32,32,32
     ,32,32,419
96   568 DATA 32,32,32,32,32,32,3
     2,32,256
11   569 DATA 32,32,32,32,32,32,3
     2,32,256
0F   570 DATA 32,32,32,106,32,23,
     18,9,284
17   571 DATA 20,20,5,14,32,32,2,
     25,150
21   572 DATA 32,116,32,32,32,32,
     32,32,340
7D   573 DATA 32,32,32,32,32,32,3
     2,32,256
30   574 DATA 32,32,32,32,32,32,3
     2,32,256
B9   575 DATA 32,32,106,119,45,32
     ,45,32,443
7A   576 DATA 45,32,45,32,45,32,4
     5,32,308
0F   577 DATA 45,119,116,32,32,32
     ,32,32,440
7C   578 DATA 32,32,32,32,32,32,3
     2,32,256
17   579 DATA 32,32,32,32,32,32,3
     2,32,256
99   580 DATA 32,32,106,32,19,20,
     5,16,262
9E   581 DATA 8,5,14,32,32,20,8,1
     5,134
99   582 DATA 13,32,116,32,32,32,
     32,32,321
73   583 DATA 32,32,32,32,32,32,3
     2,32,256
26   584 DATA 32,32,32,32,32,32,3
     2,32,256
A2   585 DATA 32,32,106,111,111,4
     5,32,45,514
34   586 DATA 32,45,32,45,32,45,3
     2,45,308
E0   587 DATA 111,111,116,32,32,3
     2,32,32,498
22   588 DATA 32,32,32,32,32,32,3
     2,32,256
0D   589 DATA 32,32,32,32,32,32,3
     2,32,256
9C   590 DATA 32,32,32,32,106,32,
     40,3,309
32   591 DATA 41,32,32,49,57,56,5
     6,32,355
71   592 DATA 116,32,32,32,32,32,
     32,32,340
09   593 DATA 32,32,32,32,32,32,3
     2,32,256
0C   594 DATA 32,32,32,32,32,32,3
     2,32,256
5E   595 DATA 32,32,32,32,106,111
     ,111,111,567
85   596 DATA 111,111,111,111,111
     ,111,111,111,888
3E   597 DATA 116,32,32,32,32,32,
     32,32,340
08   598 DATA 32,32,32,32,32,32,3
     2,32,256
03   599 DATA 32,32,32,32,32,32,3
     2,32,256
B6   600 DATA 32,32,32,32,32,32,3
     2,32,256
31   601 DATA 32,32,32,32,32,32,3
     2,32,256
34   602 DATA 32,32,32,32,32,32,3
     2,32,256
01   603 DATA 32,32,32,32,32,32,3
     2,78,302
BD   604 DATA 77,78,77,78,77,78,7
     7,78,620
BC   605 DATA 77,78,77,78,77,78,7
     7,78,620
67   606 DATA 77,78,77,78,77,78,7
     7,78,620
E6   607 DATA 77,78,77,78,77,78,7
     7,78,620
C8   608 DATA 77,78,77,78,77,78,7
     7,77,619
81   609 DATA 79,119,119,119,119,
     119,119,119,912
29   610 DATA 119,119,119,119,119
     ,119,119,119,952
BE   611 DATA 119,119,119,119,119
     ,119,119,119,952
AB   612 DATA 119,119,119,119,119
     ,119,119,119,952
6F   613 DATA 119,119,119,119,119
     ,80,78,78,831
8B   614 DATA 116,32,32,32,32,32,
     32,32,340
93   615 DATA 32,32,32,32,32,32,3
     2,32,256
B2   616 DATA 13,5,14,21,32,32,32
     ,32,181
C1   617 DATA 32,32,32,32,32,32,3
     2,32,256
5D   618 DATA 32,32,32,32,32,106,
     77,77,420
68   619 DATA 116,32,32,32,32,32,
     32,32,340
42   620 DATA 32,32,32,32,32,32,3
     2,32,256
CF   621 DATA 99,99,99,99,32,32,3
     2,32,524
E0   622 DATA 32,32,32,32,32,32,3
     2,32,256
B6   623 DATA 32,32,32,32,32,106,
     78,78,422
BE   624 DATA 116,49,46,46,3,21,5
     ,32,318
FD   625 DATA 20,1,16,5,32,32,32,
     32,170
46   626 DATA 32,32,32,32,160,52,
     46,46,432
67   627 DATA 16,12,1,25,32,19,1,
     13,119
72   628 DATA 16,12,5,32,32,106,7
     7,77,357
DE   629 DATA 116,32,32,32,32,32,
     32,32,340
AB   630 DATA 32,32,32,32,32,32,3
     2,32,256
A3   631 DATA 32,32,32,32,32,32,3
     2,32,256
D6   632 DATA 32,32,32,32,32,32,3
     2,32,256
48   633 DATA 32,32,32,32,32,106,
     78,78,422
F6   634 DATA 116,50,46,46,19,1,1
     3,16,307
A5   635 DATA 12,5,32,40,12,41,32
     ,32,206
B4   636 DATA 32,32,32,32,32,53,4
     6,46,305
AC   637 DATA 13,5,14,21,32,50,32
     ,32,199
19   638 DATA 32,32,32,32,32,106,
     77,77,420
DC   639 DATA 116,32,32,32,32,32,
     32,32,340
BE   640 DATA 32,32,32,32,32,32,3
     2,32,256
B9   641 DATA 32,32,32,32,32,32,3
     2,32,256
BC   642 DATA 32,32,32,32,32,32,3
     2,32,256
9A   643 DATA 32,32,32,32,32,106,
     78,78,422
50   644 DATA 116,51,46,46,19,1,1
     3,16,308
BA   645 DATA 12,5,32,40,19,41,32
     ,32,213
E2   646 DATA 32,32,32,32,32,54,4
     6,46,306
BB   647 DATA 17,21,9,20,32,32,32
     ,32,195
27   648 DATA 32,32,32,32,32,106,
     77,77,420
12   649 DATA 116,32,32,32,32,32,
     32,32,340
E4   650 DATA 32,32,32,32,32,32,3
     2,32,256
BF   651 DATA 32,32,32,32,32,32,3
     2,32,256
62   652 DATA 32,32,32,32,32,32,3
     2,32,256
EC   653 DATA 32,32,32,32,32,106,
     78,78,422
AD   654 DATA 76,111,111,111,111,
     111,111,111,853
62   655 DATA 111,111,111,111,111
     ,111,111,111,888
E1   656 DATA 111,111,111,111,111
     ,111,111,111,888
C0   657 DATA 111,111,111,111,111
     ,111,111,111,888
9D   658 DATA 111,111,111,111,111
     ,122,77,77,831
2E   659 DATA 78,77,78,77,78,77,7
     8,77,620
29   660 DATA 78,77,78,77,78,77,7
     8,77,620
B0   661 DATA 78,77,78,77,78,77,7
     8,77,620
B3   662 DATA 78,77,78,77,78,77,7
     8,77,620
64   663 DATA 78,77,78,77,78,77,7
     8,32,575
F6   664 DATA 32,32,32,32,32,32,3
     2,32,256
71   665 DATA 32,32,32,32,32,32,3
     2,32,256
74   666 DATA 32,32,32,32,32,32,3
     2,32,256
4F   667 DATA 32,32,32,32,32,32,3
     2,32,256
F2   668 DATA 32,32,32,32,32,32,3
     2,32,256
DD   669 DATA 32,32,32,32,32,32,3
     2,32,256
90   670 DATA 32,32,32,32,32,32,3
     2,32,256
```

```
CB  671 DATA 32,32,32,32,32,32,3
    2,32,256
DE  672 DATA 32,32,32,32,32,32,3
    2,32,256
1B  673 DATA 32,32,32,32,32,32,3
    2,255,479
C1  674 DATA 255,255,255,255,255
    ,255,255,255,2040
0A  675 DATA 255,255,255,255,255
    ,255,255,41,1826
E7  676 DATA 42,43,44,45,46,47,4
    8,0,315
14  677 DATA 0,0,0,0,0,0,0,0,0
5B  678 DATA 0,0,0,0,0,0,0,0,0
5A  679 DATA 0,0,0,0,0,0,0,0,0
59  680 DATA 0,0,0,0,0,0,0,0,0
67  681 DATA 0,0,0,14,14,14,14,0
    ,56
1F  682 DATA 0,0,0,0,0,0,0,0,0
18  683 DATA 0,0,1,1,1,1,1,1,6
15  684 DATA 1,1,1,1,1,1,1,1,8
1E  685 DATA 1,1,1,0,0,0,0,0,3
43  686 DATA 0,0,0,0,0,0,0,0,0
42  687 DATA 0,0,0,0,0,0,0,0,0
C0  688 DATA 0,0,1,0,14,14,14,14
    ,57
48  689 DATA 14,14,14,14,14,14,1
    4,14,112
29  690 DATA 14,0,1,0,0,0,0,0,15
13  691 DATA 0,0,0,0,14,14,14,0,
    42
85  692 DATA 0,0,0,0,0,0,0,0,0
82  693 DATA 0,0,1,1,0,2,0,2,6
C3  694 DATA 0,2,0,2,0,2,1,2,9
C8  695 DATA 0,1,1,0,0,0,0,0,2
C9  696 DATA 0,0,0,0,0,0,0,0,0
C8  697 DATA 0,0,0,0,0,0,0,0,0
E2  698 DATA 0,0,0,1,0,14,14,14,
    43
6A  699 DATA 14,14,14,14,14,14,1
    4,14,112
0D  700 DATA 0,1,0,0,0,0,0,0,1
0C  701 DATA 0,0,0,0,0,0,0,0,0
33  702 DATA 0,0,0,0,0,0,0,0,0
3A  703 DATA 0,0,1,1,2,1,2,1,8
39  704 DATA 2,1,2,0,2,0,2,0,9
36  705 DATA 2,1,1,0,0,0,0,0,4
77  706 DATA 0,0,0,0,0,0,0,0,0
76  707 DATA 0,0,0,0,0,0,0,0,0
EC  708 DATA 0,0,1,0,14,14,14,14
    ,57
3C  709 DATA 14,14,14,14,14,14,1
    4,14,112
25  710 DATA 14,0,1,0,0,0,0,0,15
3A  711 DATA 0,0,0,0,0,0,0,0,0
39  712 DATA 0,0,0,0,0,0,0,0,0
3E  713 DATA 0,0,1,1,1,2,0,2,7
77  714 DATA 0,2,0,2,0,2,0,2,8
7C  715 DATA 1,1,1,0,0,0,0,0,3
7D  716 DATA 0,0,0,0,0,0,0,0,0
7C  717 DATA 0,0,0,0,0,0,0,0,0
47  718 DATA 0,0,0,0,1,0,14,14,2
    9
C6  719 DATA 14,14,14,14,14,14,1
    4,0,98
21  720 DATA 1,0,0,0,0,0,0,0,1
0A  721 DATA 0,0,0,0,0,0,14,0,14
E7  722 DATA 0,0,0,0,0,0,0,0,0
E2  723 DATA 0,0,0,0,1,1,1,1,4
ED  724 DATA 1,1,1,1,1,1,1,1,8
E4  725 DATA 1,0,0,0,0,0,0,0,1
AB  726 DATA 0,0,0,0,0,0,0,0,0
AA  727 DATA 0,0,0,0,0,0,0,0,0
A9  728 DATA 0,0,0,0,0,0,0,0,0
AC  729 DATA 1,1,1,1,1,0,0,0,5
6F  730 DATA 0,0,0,0,0,0,0,0,0
6E  731 DATA 0,0,0,0,0,0,0,1,1
65  732 DATA 1,1,1,1,1,1,1,1,8
64  733 DATA 1,1,1,1,1,1,1,1,8
9B  734 DATA 1,1,1,1,1,1,1,1,8
9A  735 DATA 1,1,1,1,1,1,1,1,8
99  736 DATA 1,1,1,1,1,1,1,1,8
EC  737 DATA 6,6,6,6,6,6,6,6,48
2B  738 DATA 6,6,6,6,6,6,6,6,48
2A  739 DATA 6,6,6,6,6,6,6,6,48
29  740 DATA 6,6,6,6,6,6,6,6,48
D7  741 DATA 6,6,6,6,6,6,1,1,38
5B  742 DATA 6,0,0,0,0,0,0,0,6
9A  743 DATA 0,0,0,0,0,0,0,0,0
9D  744 DATA 1,1,1,1,0,0,0,0,4
98  745 DATA 0,0,0,0,0,0,0,0,0
49  746 DATA 0,0,0,0,0,6,1,1,8
9E  747 DATA 6,0,0,0,0,0,0,0,6
5D  748 DATA 0,0,0,0,0,0,0,0,0
26  749 DATA 7,7,7,7,0,0,0,0,28
83  750 DATA 0,0,0,0,0,0,0,0,0
94  751 DATA 0,0,0,0,0,6,1,1,8
17  752 DATA 6,14,14,14,14,14,14
    ,14,104
DF  753 DATA 14,14,14,14,0,0,0,0
    ,56
14  754 DATA 0,0,0,0,0,14,14,14
    42
02  755 DATA 14,14,14,14,14,14,
    4,14,112
8D  756 DATA 14,14,14,0,0,6,1,1
    50
84  757 DATA 6,0,0,0,0,0,0,0,6
0B  758 DATA 0,0,0,0,0,0,0,0,0
0A  759 DATA 0,0,0,0,0,0,0,0,0
09  760 DATA 0,0,0,0,0,0,0,0,0
AE  761 DATA 0,0,0,0,0,6,1,1,8
61  762 DATA 6,14,14,14,14,14,1
    ,14,104
C0  763 DATA 14,14,14,14,14,14,
    ,0,84
1E  764 DATA 0,0,0,0,0,14,14,14,
    42
C6  765 DATA 14,14,14,14,14,14,0
    ,0,84
05  766 DATA 0,0,0,0,0,6,1,1,8
B2  767 DATA 6,0,0,0,0,0,0,0,6
70  768 DATA 0,0,0,0,0,0,0,0,0
B7  769 DATA 0,0,0,0,0,0,0,0,0
B6  770 DATA 0,0,0,0,0,0,0,0,0
93  771 DATA 0,0,0,0,0,6,1,1,8
82  772 DATA 6,14,14,14,14,14,14
    ,14,104
E7  773 DATA 14,14,14,14,14,14,0
    ,0,84
27  774 DATA 0,0,0,0,0,14,14,14,
    42
62  775 DATA 14,14,14,14,0,0,0,0
    ,56
9E  776 DATA 0,0,0,0,0,6,1,1,8
7F  777 DATA 6,0,0,0,0,0,0,0,6
BE  778 DATA 0,0,0,0,0,0,0,0,0
BD  779 DATA 0,0,0,0,0,0,0,0,0
BC  780 DATA 0,0,0,0,0,0,0,0,0
75  781 DATA 0,0,0,0,0,6,1,1,8
BE  782 DATA 6,6,6,6,6,6,6,6,48
BD  783 DATA 6,6,6,6,6,6,6,6,48
BC  784 DATA 6,6,6,6,6,6,6,6,48
FB  785 DATA 6,6,6,6,6,6,6,6,48
A5  786 DATA 6,6,6,6,6,6,1,1,38
2D  787 DATA 1,1,1,1,1,1,1,1,8
2C  788 DATA 1,1,1,1,1,1,1,1,8
E3  789 DATA 1,1,1,1,1,1,1,1,8
E2  790 DATA 1,1,1,1,1,1,1,1,8
EF  791 DATA 1,1,1,1,1,1,1,0,7
E8  792 DATA 0,0,0,0,0,0,0,0,0
AF  793 DATA 0,0,0,0,0,0,0,0,0
AE  794 DATA 0,0,0,0,0,0,0,0,0
AD  795 DATA 0,0,0,0,0,0,0,0,0
AC  796 DATA 0,0,0,0,0,0,0,0,0
D3  797 DATA 0,0,0,0,0,0,0,0,0
D2  798 DATA 0,0,0,0,0,0,0,0,0
D1  799 DATA 0,0,0,0,0,0,0,0,0
D0  800 DATA 0,0,0,0,0,0,0,0,0
97  801 DATA 0,0,0,0,0,0,0,0,0
96  802 DATA 0,0,0,0,0,0,0,0,0
95  803 DATA 0,0,0,0,0,0,0,0,0
EA  804 DATA 0,0,0,0,0,0,0,78,78
6F  805 DATA 77,78,77,78,77,78,7
    7,78,620
2E  806 DATA 77,78,77,78,77,78,7
    7,78,620
71  807 DATA 77,78,77,78,77,78,7
    7,78,620
70  808 DATA 77,78,77,78,77,78,7
    7,78,620
16  809 DATA 77,78,77,78,77,78,7
    7,77,619
03  810 DATA 79,119,119,119,119,
    119,119,119,912
E3  811 DATA 119,119,119,119,119
    ,119,119,119,952
70  812 DATA 119,119,119,119,119
    ,119,119,119,952
15  813 DATA 119,119,119,119,119
    ,119,119,119,952
4D  814 DATA 119,119,119,119,119
    ,80,78,78,831
D1  815 DATA 116,32,32,32,32,32,
    32,32,340
3B  816 DATA 32,32,32,32,32,19,5
    ,3,187
EC  817 DATA 15,14,4,32,13,5,14,
    21,118
47  818 DATA 32,32,32,32,32,32,3
    2,32,256
EB  819 DATA 32,32,32,32,32,106,
    77,77,420
9E  820 DATA 116,32,32,32,32,32,
    32,32,340
C2  821 DATA 32,32,32,32,32,99,9
    9,99,457
AC  822 DATA 99,99,99,99,99,99,9
    9,99,792
96  823 DATA 32,32,32,32,32,32,3
    2,32,256
08  824 DATA 32,32,32,32,32,105,
    78,78,422
9F  825 DATA 116,32,32,32,32,32,
    32,32,340
6F  826 DATA 32,32,32,32,32,32,3
    2,32,256
92  827 DATA 32,32,32,32,32,32,3
    2,32,256
7D  828 DATA 32,32,32,32,32,32,3
    2,32,256
D9  829 DATA 32,32,32,32,32,106,
    77,77,420
39  830 DATA 116,32,32,32,32,32,
    49,46,371
FF  831 DATA 46,16,12,1,25,32,19
    ,1,152
E2  832 DATA 13,16,12,5,32,9,14,
    32,133
50  833 DATA 18,5,22,5,18,19,5,3
    2,124
5A  834 DATA 32,32,32,32,32,106,
    78,78,422
65  835 DATA 116,32,32,32,32,32,
    32,32,340
45  836 DATA 32,32,32,32,32,32,3
    2,32,256
78  837 DATA 32,32,32,32,32,32,3
    2,32,256
73  838 DATA 32,32,32,32,32,32,3
    2,32,256
E7  839 DATA 32,32,32,32,32,106,
    77,77,420
CA  840 DATA 116,32,32,32,32,32,
    50,46,372
C5  841 DATA 46,3,8,1,14,7,5,32,
    116
CB  842 DATA 19,16,5,5,4,32,15,6
    ,102
91  843 DATA 32,19,1,13,16,12,5,
    32,130
5E  844 DATA 40,19,41,32,32,106,
    78,78,426
33  845 DATA 116,32,32,32,32,32,
    32,32,340
3B  846 DATA 32,32,32,32,32,32,3
    2,32,256
0E  847 DATA 32,32,32,32,32,32,3
```

```
    2,32,256
09  848 DATA 32,32,32,32,32,32,3
    2,32,256
D5  849 DATA 32,32,32,32,32,106,
    77,77,420
54  850 DATA 116,32,32,32,32,32,
    51,46,373
82  851 DATA 46,13,1,14,21,1,12,
    32,140
21  852 DATA 16,12,1,25,32,40,19
    ,41,186
08  853 DATA 32,32,32,32,32,32,3
    2,32,256
DE  854 DATA 32,32,32,32,32,106,
    78,78,422
39  855 DATA 116,32,32,32,32,32,
    32,32,340
31  856 DATA 32,32,32,32,32,32,3
    2,32,256
34  857 DATA 32,32,32,32,32,32,3
    2,32,256
0F  858 DATA 32,32,32,32,32,32,3
    2,32,256
23  859 DATA 32,32,32,32,32,106,
    77,77,420
42  860 DATA 116,32,32,32,32,32,
    52,46,374
1C  861 DATA 46,3,18,15,16,32,19
    ,1,150
3F  862 DATA 13,16,12,5,32,32,32
    ,32,174
9E  863 DATA 32,32,32,32,32,32,3
    2,32,256
F0  864 DATA 32,32,32,32,32,106,
    78,78,422
07  865 DATA 116,32,32,32,32,32,
    32,32,340
37  866 DATA 32,32,32,32,32,32,3
    2,32,256
9A  867 DATA 32,32,32,32,32,32,3
    2,32,256
96  868 DATA 32,32,32,233,160,16
    0,223,32,904
D1  869 DATA 32,32,32,32,32,106,
    77,77,420
78  870 DATA 116,32,32,32,32,32,
    53,46,375
DE  871 DATA 46,19,3,18,5,5,14,3
    2,142
DF  872 DATA 8,5,12,16,32,32,121
    ,98,324
7A  873 DATA 248,247,227,160,130
    ,153,160,227,1552
E5  874 DATA 247,248,98,121,32,1
    06,78,78,1008
CD  875 DATA 116,32,32,32,32,32,
    32,32,340
AD  876 DATA 32,32,32,32,32,32,3
    2,32,256
25  877 DATA 32,32,32,32,32,32,1
    60,160,512
4D  878 DATA 160,160,160,160,160
    ,160,160,160,1280
BB  879 DATA 160,160,160,160,32,
    106,77,77,932
D2  880 DATA 116,32,32,32,32,32,
    54,46,376
4D  881 DATA 46,11,9,12,12,32,19
    ,1,142
C4  882 DATA 13,16,12,5,32,32,16
    0,147,417
E0  883 DATA 148,133,144,136,133
    ,142,160,148,1144
14  884 DATA 136,143,141,160,32,
    106,78,78,874
1B  885 DATA 116,32,32,32,32,32,
    32,32,340
A3  886 DATA 32,32,32,32,32,32,3
    2,32,256
75  887 DATA 32,32,32,32,32,32,9
    9,119,410
4C  888 DATA 120,226,249,239,228
    ,228,239,249,1778
0A  889 DATA 226,120,119,99,32,1
    06,77,77,856
9C  890 DATA 116,32,32,32,32,32,
    55,46,377
EB  891 DATA 46,13,1,9,14,32,13,
    5,133
9B  892 DATA 14,21,32,32,32,32,3
    2,32,227
70  893 DATA 32,32,32,32,32,32,3
    2,32,256
26  894 DATA 32,32,32,32,32,106,
    78,78,422
A1  895 DATA 116,32,32,32,32,32,
    32,32,340
B9  896 DATA 32,32,32,32,32,32,3
    2,32,256
BC  897 DATA 32,32,32,32,32,32,3
    2,32,256
57  898 DATA 32,32,32,32,32,32,3
    2,32,256
1B  899 DATA 32,32,32,32,32,106,
    77,77,420
EE  900 DATA 116,32,32,32,32,32,
    32,32,340
B8  901 DATA 32,32,32,32,32,32,3
    2,32,256
B3  902 DATA 32,32,32,32,32,32,3
    2,32,256
66  903 DATA 32,32,32,32,32,32,3
    2,32,256
F8  904 DATA 32,32,32,32,32,106,
    78,78,422
29  905 DATA 76,111,111,111,111,
    111,111,111,853
3E  906 DATA 111,111,111,111,111
    ,111,111,111,888
5D  907 DATA 111,111,111,111,111
    ,111,111,111,888
5C  908 DATA 111,111,111,111,111
    ,111,111,111,888
31  909 DATA 111,111,111,111,111
    ,122,77,77,831
72  910 DATA 78,77,78,77,78,77,7
    8,77,620
AD  911 DATA 78,77,78,77,78,77,7
    8,77,620
94  912 DATA 78,77,78,77,78,77,7
    8,77,620
07  913 DATA 78,77,78,77,78,77,7
    8,77,620
28  914 DATA 78,77,78,77,78,77,7
    8,32,575
4A  915 DATA 32,32,32,32,32,32,3
    2,32,256
15  916 DATA 32,32,32,32,32,32,3
    2,32,256
48  917 DATA 32,32,32,32,32,32,3
    2,32,256
43  918 DATA 32,32,32,32,32,32,3
    2,32,256
F6  919 DATA 32,32,32,32,32,32,3
    2,32,256
71  920 DATA 32,32,32,32,32,32,3
    2,32,256
74  921 DATA 32,32,32,32,32,32,3
    2,32,256
4F  922 DATA 32,32,32,32,32,32,3
    2,32,256
F2  923 DATA 32,32,32,32,32,32,3
    2,32,256
DD  924 DATA 32,32,32,32,32,32,3
    2,32,256
90  925 DATA 32,32,32,32,32,32,3
    2,32,256
CB  926 DATA 32,32,32,32,32,32,3
    2,32,256
DE  927 DATA 32,32,32,32,32,32,3
    2,32,256
D9  928 DATA 32,32,32,32,32,32,3
    2,32,256
FE  929 DATA 32,32,32,32,32,32,3
    2,255,479
C0  930 DATA 255,255,255,255,255
    ,255,255,255,2040
0F  931 DATA 255,255,255,255,255
    ,255,255,41,1826
EA  932 DATA 42,43,44,45,46,47,4
    8,1,316
53  933 DATA 1,1,1,1,1,1,1,1,8
52  934 DATA 1,1,1,1,1,1,1,1,8
51  935 DATA 1,1,1,1,1,1,1,1,8
50  936 DATA 1,1,1,1,1,1,1,1,8
17  937 DATA 1,1,1,1,1,1,1,1,8
F2  938 DATA 6,6,6,6,6,6,6,6,48
F1  939 DATA 6,6,6,6,6,6,6,6,48
F0  940 DATA 6,6,6,6,6,6,6,6,48
9F  941 DATA 6,6,6,6,6,6,6,6,48
91  942 DATA 6,6,6,6,6,6,1,1,38
9D  943 DATA 6,6,6,6,6,6,6,6,48
AD  944 DATA 6,6,6,6,6,2,2,2,36
BC  945 DATA 2,2,2,2,2,2,2,2,16
DA  946 DATA 6,6,6,6,6,6,6,6,48
86  947 DATA 6,6,6,6,6,6,1,1,38
44  948 DATA 6,0,0,0,0,0,0,0,6
C9  949 DATA 0,0,0,0,0,1,1,1,3
C2  950 DATA 1,1,1,1,1,1,1,1,8
C9  951 DATA 0,0,0,0,0,0,0,0,0
6E  952 DATA 0,0,0,0,0,6,1,1,8
CF  953 DATA 6,0,0,0,0,0,0,0,6
0E  954 DATA 0,0,0,0,0,0,0,0,0
0D  955 DATA 0,0,0,0,0,0,0,0,0
0C  956 DATA 0,0,0,0,0,0,0,0,0
C5  957 DATA 0,0,0,0,0,6,1,1,8
9B  958 DATA 6,0,14,14,14,14,14,
    14,90
F3  959 DATA 14,14,14,14,14,14,1
    4,14,112
58  960 DATA 14,14,14,14,14,14,1
    4,14,112
63  961 DATA 14,14,14,14,14,14,1
    4,0,98
50  962 DATA 0,0,0,0,0,6,1,1,8
35  963 DATA 6,0,0,0,0,0,0,0,6
74  964 DATA 0,0,0,0,0,0,0,0,0
3B  965 DATA 0,0,0,0,0,0,0,0,0
3A  966 DATA 0,0,0,0,0,0,0,0,0
5F  967 DATA 0,0,0,0,0,6,1,1,8
BD  968 DATA 6,0,14,14,14,14,14,
    14,90
BD  969 DATA 14,14,14,14,14,14,1
    4,14,112
3A  970 DATA 14,14,14,14,14,14,1
    4,14,112
BF  971 DATA 14,14,14,14,14,14,1
    4,14,112
78  972 DATA 14,14,14,0,0,6,1,1,
    50
E3  973 DATA 6,0,0,0,0,0,0,0,6
22  974 DATA 0,0,0,0,0,0,0,0,0
21  975 DATA 0,0,0,0,0,0,0,0,0
20  976 DATA 0,0,0,0,0,0,0,0,0
41  977 DATA 0,0,0,0,0,6,1,1,8
A5  978 DATA 6,0,0,0,0,0,14,14,3
    4
C7  979 DATA 14,14,14,14,14,14,1
    4,14,112
CC  980 DATA 14,14,14,14,14,14,1
    4,14,112
D4  981 DATA 14,14,14,14,0,0,0,0
CC  982 DATA 0,0,0,0,0,6,1,1,8
69  983 DATA 6,0,0,0,0,0,0,0,6
A8  984 DATA 0,0,0,0,0,0,0,0,0
6F  985 DATA 0,0,0,0,0,0,0,0,0
6E  986 DATA 0,0,0,0,0,0,0,0,0
5B  987 DATA 0,0,0,0,0,6,1,1,8
7B  988 DATA 6,0,0,0,0,0,14,14,3
    4
11  989 DATA 14,14,14,14,14,14,1
    4,14,112
B1  990 DATA 14,14,14,14,0,0,0,0
    ,56
DD  991 DATA -1
```

**FINAL PART NEXT MONTH....**

MUSIC COMPOSER

PROGRAM: MUSIC COMPOSER

```
DB  1 IFPEEK(49152)=32ANDPEEK(49
    153)=121THEN3
51  2 FORI=49152TO49531:READA:PO
    KEI,A:NEXTI
20  3 POKE53280,0:POKE53281,0:PR
    INTCHR$(142);CHR$(8):K$="Q2W
    3ERST6Y7UI900P@-*£^"
B4  9 S=54272:SA=49152:LE=512:V=
    1:M=1:OC=4:DIMF(26),K(255)
FA  10 A1=0:D1=9:S1=9:R1=15:A2=0
    :D2=9:S2=9:R2=15:A3=0:D3=9:S
    3=9:R3=15:TP=5:N1=1:N=1
D8  13 F1=7040:FORI=1TO26:F(27-I
    )=F1*5.8+30:F1=F1/2^(1/12):N
    EXT
0D  17 FORI=1TOLEN(K$):K(ASC(MID
    $(K$,I)))=I:NEXT:SYSSA,C,L15
F5  19 DIMFQ(3,680),ST(3,680):GO
    TO4800:GOTO400
B7  20 IFV=1THENFQ(V,N)=-1:ST(V,
    N)=-1:FQ(2,1)=-1:ST(2,1)=-1:
    ST(3,1)=-1:FQ(3,1)=-1
C9  21 IFV=2ANDN=1THENST(2,1)=-1
    :ST(3,1)=-1:FQ(3,1)=-1:FQ(2,
    1)=-1
01  23 IFV=2THENFQ(V,N)=-1:ST(V,
    N)=-1:FQ(3,1)=-1:ST(3,1)=-1
74  25 IFV=3ANDN=1THENST(3,1)=-1
    :FQ(3,1)=-1
43  26 IFV=3THENFQ(V,N)=-1:ST(V,
    N)=-1
5A  27 PRINT"[CLR]OUTPUT TO [RVS
    ON]S[RVSOFF]CREEN OR [RVSON]
    P[RVSOFF]RINTER"
C2  28 GETA$:IFA$<>"S"ANDA$<>"P"
    THEN28
2A  29 NU=4:IFA$="S"THENNU=3
2B  30 OPEN3,NU:PRINT#3:FORW=1TO
    3:N6=1:N7=1:C=1
78  31 PRINT"[CLR,SSPC,SPC12,RVS
    ON]VOICE";W;"[RVSOFF]"
13  32 PRINT#3,"[SO,CY4,SP,CY7,S
    P,CY7,SP,CY7,SP]"
A5  33 PRINT#3,"[CG]NOTE[CN]HIGH
    [SPC3,CN]LOW[SPC4,CN]LENGTH
    [CN]"
C8  34 PRINT#3,"[SL,CP4,S@,CP7,S
    @,CP7,S@,CP7,S@]"
ED  35 FORI=1TO18:PRINT#3,"[CH,S
    PC4,CN,SPC7,CN,SSPC,SPC6,CN,
    SPC7,CN]":NEXT:PRINT#3,"[HOM
    E,DOWN4]";
DA  37 IFFQ(W,C)=-1THEN52
1F  38 FR=FQ(W,C):HF%=FR/256:LF%
    =FR-256*HF%
0D  39 PRINTTAB(1)N6TAB(6)HF%TAB
    (16)LF%;:LW=1
87  41 IFST(W,LW+C)=0THENLW=LW+1
    :GOTO41
0E  44 PRINTTAB(26)LW:C=C+LW:N6=
    N6+1
57  45 N7=N7+1:IFN7=18THENN7=1:G
    OTO48
F3  46 LW=1:GOTO37
67  47 H
DC  48 POKE198,0:WAIT198,1
DA  49 GOTO31
20  52 POKE198,0:WAIT198,1
11  54 NEXTW:CLOSE3:GOTO4800
48  400 PRINT"[SU,S*14,SI]
F3  410 PRINT"[SB,SPC3,RVSON]2ND
    MODE[RVSOFF,SPC3,SB]
8A  420 PRINT"[SB]FREQ. DISPLAY
    [SB]
E3  421 PRINT"[SB]CHANGE ATTACK
    [SB]
52  422 PRINT"[SB]CHANGE DECAY
    [SB]
00  423 PRINT"[SB]CHANGE SUSTAIN
    [SB]
5F  424 PRINT"[SB]CHANGE RELEASE
    [SB]
AA  425 PRINT"[SB]CHANGE TEMPO
    [SB]
58  426 PRINT"[SB,SPC14,SB]
57  427 PRINT"[SB,SPC14,SB]
56  428 PRINT"[SB,SPC14,SB]
0A  429 PRINT"[SB]NOTE NO=";N1;T
    AB(15)"[SB]"
5D  430 PRINT"[SJ,S*14,SK]
82  440 A$="[RIGHT16]"
57  450 PRINT"[HOME,DOWN]"A$"[SU
    ,S*13,SI]"
B0  460 PRINTA$"[SB,SPC4,RVSON]M
    ODE[RVSOFF,SPC5,SB]"
74  470 PRINTA$"[SB]DELETE NOTE
     [SB]"
E2  480 PRINTA$"[SB]PLAY MUSIC
    [SSPC,SB]"
FD  490 PRINTA$"[SB]SAVE MUSIC[S
    PC3,SB]"
F6  500 PRINTA$"[SB]EXIT MODE[SP
    C4,SB]"
36  510 PRINTA$"[SB]NEXT VOICE[S
    PC3,SB]"
4D  520 PRINTA$"[SB]LOAD MUSIC[S
    PC3,SB]"
6F  530 PRINTA$"[SJ,S*13,SK]"
74  540 PRINTA$"[SU,S*13,SI]"
79  550 PRINTA$"[SB]OCTAVE =";OC
    ;"  [SB]"
95  560 PRINTA$"[SB]VOICE  =";V;
    "  [SB]"
47  570 PRINTA$"[SJ,S*13,SK]"
48  575 PRINT"[SU,S*25,SI]"
72  580 PRINT"[SB,RVSON] [RIGHT]
     [RIGHT] [SB] [RIGHT] [RIGHT
    ] [RIGHT] [SB] [RIGHT] [RIGH
    T] [SB] [RIGHT] [RIGHT] [RVS
    OFF,SB]"
1C  590 PRINT"[SB,RVSON] [RIGHT]
     [RIGHT] [SB] [RIGHT] [RIGHT
    ] [RIGHT] [SB] [RIGHT] [RIGH
    T] [SB] [RIGHT] [RIGHT] [RVS
    OFF,SB]"
16  600 PRINT"[SB,RVSON] [RIGHT]
     [RIGHT] [SB] [RIGHT] [RIGHT
    ] [RIGHT] [SB] [RIGHT] [RIGH
    T] [SB] [RIGHT] [RIGHT] [RVS
    OFF,SB]"
90  610 PRINT"[SB,RVSON] [RIGHT]
     [RIGHT] [SB] [RIGHT] [RIGHT
    ] [RIGHT] [SB] [RIGHT] [RIGH
    T] [SB] [RIGHT] [RIGHT] [RVS
    OFF,SB]"
97  620 PRINT"[SB,RVSON] [SB] [S
    B] [SB] [SB] [SB] [SB] [SB]
    [SB] [SB] [SB] [SB] [SB] [RV
    SOFF,SB]"
56  630 PRINT"[SB,RVSON]Q[SB]W[S
    B]E[SB]R[SB]T[SB]Y[SB]U[SB]I
    [SB]O[SB]P[SB]@[SB]*[SB]^[RV
    SOFF,SB]"
64  640 PRINT"[YELLOW,SB,RVSON]C
    [SB]D[SB]E[SB]F[SB]G[SB]A[SB
    ]B[SB]C[SB]D[SB]E[SB]F[SB]G[
    SB]A[RVSOFF,WHITE,SB]"
A3  645 PRINT"[SJ,S*25,SK]"
6A  650 A$="[RIGHT31]"
5D  660 PRINT"[HOME,DOWN]"A$"[SU
    ,S*7,SI]";
D8  670 PRINTA$"[SB]F1-MODE[SB]".
    ;
F1  680 PRINTA$"[SB]F3-2ND [SB]"
    ;
C0  690 PRINTA$"[SB,SPC3]MODE[SB
    ]";
E3  700 PRINTA$"[CQ,S*7,CW]";
25  710 PRINTA$"[SB] , & . [SB]"
    ;
32  720 PRINTA$"[SB]DEC/INC[SB]"
    ;
77  730 A$="[RIGHT28]"
40  740 PRINT"[HOME,DOWN14]"A$"[
    SU,S*10,SI]";
CD  750 PRINTA$"[SB]TO  PLAY A[S
    B]";
D8  760 PRINTA$"[SB]NOTE,PRESS[S
    B]";
F5  770 PRINTA$"[SB]ANY KEY[SPC3
    ,SB]";
C9  780 PRINTA$"[SB]FROM THE  [S
    B]";
16  790 PRINTA$"[SB]FIRST ROW.[S
    B]";
6F  800 PRINTA$"[SJ,S*10,SK]";
29  810 A$="[RIGHT31]"
33  820 PRINT"[HOME,DOWN8]"A$"[S
    B]LENGTH.[SB]";
92  830 PRINTA$"[CQ,S*7,CW]";
ED  840 PRINTA$"[SB]: & ;  [SB]"
    ;
BD  850 PRINTA$"[SB]DEC/INC[SB]"
    ;
76  860 PRINTA$"[SB]OCTAVE.[SB]"
    ;
23  870 PRINTA$"[SJ,S*7,SK]";
AF  880 A$="[RIGHT27]"
7B  885 PRINT"[HOME,DOWN21]"A$"[
    SU,S*11,SI]";
40  890 PRINTA$"[SB]LENGTH 512 [
    SB]";
46  895 PRINTA$"[SJ,S*11,SK]";
A8  898 SYSSA,V1,WS,A(A1),D(D1),
    S(S1),R(R1):SYSSA,V2,WS,A(A2
    ),D(D2),S(S2),R(R2)
25  899 SYSSA,V3,WS,A(A3),D(D3),
    S(S3),R(R3)
07  900 GETA$:IFA$=""THEN900
3D  901 IFA$="[F3]"THEN6000
43  905 IFA$=" "THENGOSUB2300:GO
    TO900
99  910 IFA$="[F1]"THENGOSUB1200
    :GOTO900
13  920 IFA$=":"ORA$=";"THENGOSU
    B1900:GOTO900
2E  925 IFA$=","ORA$="."THENGOSU
    B1800:GOTO900
F5  930 F1=F(K(ASC(A$)))/M:F1=IN
    T(F1)
26  935 IFF1=0THEN900
92  940 SYSSA,V1,F(F1)
15  950 L2%=LE/128:IFL2%=1THENFQ
    (V,N)=F1:ST(V,N)=1:N=N+1:N1=
    N1+1:GOTO980
0D  960 FQ(V,N)=F1:ST(V,N)=1:N=N
    +1:N1=N1+1
5B  970 FORJ=1TOL2%-1:FQ(V,N)=F1
    :ST(V,N)=0:N=N+1:IFN=689THEN
    4020
50  975 NEXT
6D  980 FORJ=1TO200:NEXTJ:SYSSA,
    C:GOSUB1700:GOTO900
49  1200 E=1:GOTO1250
3F  1240 GETA$:IFA$<>"[DOWN]"AND
    A$<>CHR$(13)THEN1240
43  1243 IFA$=CHR$(13)THEN1370
B8  1245 E=E+1:IFE=7THENE=1
43  1250 IFE=1THENPRINT"[HOME,DO
    WN3,RVSON,RIGHT17]DELETE NOT
    E[RVSOFF]":GOTO1310
44  1260 IFE=2THENPRINT"[HOME,DO
    WN4,RVSON,RIGHT17]PLAY MUSIC
    [RVSOFF]":GOTO1320
3E  1270 IFE=3THENPRINT"[HOME,DO
    WN5,RVSON,RIGHT17]SAVE MUSIC
    [RVSOFF]":GOTO1330
27  1280 IFE=4THENPRINT"[HOME,DO
    WN6,RVSON,RIGHT17]EXIT MODE[
```

```
   RVSOFF]":GOTO1340
D6 1290 IFE=5THENPRINT"[HOME,DO
   WN7,RVSON,RIGHT17]NEXT VOICE
   [RVSOFF]":GOTO1350
41 1300 IFE=6THENPRINT"[HOME,DO
   WN8,RVSON,RIGHT17]LOAD MUSIC
   [RVSOFF]":GOTO1360
F1 1310 PRINT"[HOME,DOWN8,RIGHT
   17]LOAD MUSIC":GOTO1240
6A 1320 PRINT"[HOME,DOWN3,RIGHT
   17]DELETE NOTE":GOTO1240
81 1330 PRINT"[HOME,DOWN4,RIGHT
   17]PLAY MUSIC":GOTO1240
01 1340 PRINT"[HOME,DOWN5,RIGHT
   17]SAVE MUSIC":GOTO1240
91 1350 PRINT"[HOME,DOWN6,RIGHT
   17]EXIT MODE":GOTO1240
F2 1360 PRINT"[HOME,DOWN7,RIGHT
   17]NEXT VOICE":GOTO1240
69 1370 ONEGOTO2000,1500,4000,4
   900,2100,4500
17 1500 ST(1,0)=1:FQ(1,0)=FQ(1,
   100):N5=0
3E 1510 N5=N5+1:IFFQ(1,N5)=-1OR
   N5>NTHEN1560
C4 1520 IFST(1,N5)=1THENSYSSA,V
   1,F(FQ(1,N5))
E7 1530 IFST(2,N5)=1THENSYSSA,V
   2,F(FQ(2,N5))
57 1540 IFST(3,N5)=1THENSYSSA,V
   3,F(FQ(3,N5))
27 1550 FORT=1TOTP*10:NEXTT:GOT
   O1510
DF 1560 PRINT"[HOME,DOWN4,RIGHT
   17]PLAY MUSIC":SYSSA,C:RETUR
   N
33 1700 PRINT"[HOME,DOWN11,RIGH
   T17]OCTAVE ="OC
34 1710 PRINT"[HOME,DOWN12,RIGH
   T17]VOICE  ="V
97 1720 PRINT"[HOME,DOWN22,RIGH
   T28]LENGTH[SPC5,LEFT4]";
A1 1730 PRINT"[LEFT]"LE
29 1740 PRINT"[HOME,DOWN12,RIGH
   T9]";N1;"[LEFT] ":RETURN
37 1800 IFA$="."ANDLE<4096THENL
   E=LE+64:GOSUB1700:RETURN
5E 1820 IFA$=","ANDLE>128THENLE
   =LE-64:GOSUB1700:RETURN
57 1900 IFA$=";"ANDOC<5THENOC=O
   C+1:M=M/2:GOSUB1700:RETURN
69 1920 IFA$=":"ANDOC>0THENOC=O
   C-1:M=M*2:GOSUB1700:RETURN
A2 2000 IFN1=1THEN2030
0D 2010 N1=N1-1
8E 2020 FQ(V,N)=0:ST(V,N)=0:N=N
   -1:IFST(V,N)=1THENFQ(V,N)=0:
   ST(V,N)=0:GOTO2030
FD 2025 GOTO2020
BF 2030 PRINT"[HOME,DOWN3,RIGHT
   17]DELETE NOTE":GOSUB1700:RE
   TURN
06 2100 FQ(V,N)=-1:ST(V,N)=-1
07 2120 V=V+1:IFV=4THENV=1:GOTO
   4000
4B 2125 N1=1:N=1:GOSUB1700
81 2130 PRINT"[HOME,DOWN7,RIGHT
   17]NEXT VOICE":RETURN
18 2300 L2%=LE/128:FORT=NTON+L2
   %:FQ(V,T)=0:ST(V,T)=0:NEXTT:
   N1=N1+1:N=N+L2%
C2 2320 GOSUB1700:RETURN
58 3090 IFFQ(W,C)=-1THEN3180
4D 3100 FR=FQ(W,C):HF%=FR/256:L
   F%=FR-256*HF%
A8 3110 PRINTTAB(1)N6TAB(6)HF%T
   AB(16)LF%;:LW=1
0B 3120 IFST(W,LW+C)=0THENLW=LW
   +1:GOTO3120
48 3130 PRINTTAB(26)LW:C=C+LW:N
   6=N6+1
54 3140 N7=N7+1:IFN7=18THENN7=1
   :GOTO3160
B9 3150 LW=1:GOTO3090
B3 3160 GETA$:IFA$=""THEN3160
6D 3170 GOTO3030
11 3180 GETA$:IFA$=""THEN3180
FA 3190 NEXTW:GOTO4800
CE 4000 FORJ=1TO3:FQ(J,N)=-1:ST
   (J,N)=-1:NEXT
87 4020 PRINT"[CLR,RIGHT11,RVSO
   N]SAVE MUSIC[RVSOFF,DOWN3]"
30 4050 INPUT"FILENAME";F$:IFF$
   =""THEN4800
F7 4060 F$=LEFT$(F$,16)
2B 4070 PRINT"[DOWN2]TAPE OR DI
   SK (T/D)?"
9A 4080 GETA$:IFA$<>"T"ANDA$<>"
   D"THEN4080
50 4090 IFA$="T"THEN4110
29 4100 OPEN1,8,4,"@:"+F$+",W":
   C=1:GOTO4120
B8 4110 OPEN1,1,1,F$:C=1
74 4120 PRINT#1,FQ(1,C):PRINT#1
   ,ST(1,C)
38 4125 IFFQ(1,C)=-1THENC=1:GOT
   O4130
7F 4126 C=C+1:GOTO4120
E2 4130 PRINT#1,FQ(2,C):PRINT#1
   ,ST(2,C)
2E 4135 IFFQ(2,C)=-1THENC=1:GOT
   O4140
52 4136 C=C+1:GOTO4130
E4 4140 PRINT#1,FQ(3,C):PRINT#1
   ,ST(3,C)
5F 4145 IFFQ(3,C)=-1THEN4150
F5 4146 C=C+1:GOTO4140
D5 4150 CLOSE1:PRINT"[DOWN2]OK"
   :FORI=1TO200:NEXT
55 4160 GOTO4800
C1 4500 PRINT"[CLR,SPC12,RVSON]
   LOAD MUSIC[RVSOFF,DOWN3]"
E2 4530 INPUT"FILENAME";F$:IFF$
   =""THEN4800
A1 4540 F$=LEFT$(F$,16)
52 4550 PRINT"[DOWN2]TAPE OR DI
   SK (T/D)?";
43 4560 GETA$:IFA$<>"T"ANDA$<>"
   D"THEN4560
F2 4570 IFA$="T"THEN4590
CE 4580 OPEN1,8,4,F$+",R":C=1:G
   OTO4600
1A 4590 OPEN1,1,0,F$:C=1
3D 4600 INPUT#1,FQ(1,C):INPUT#1
   ,ST(1,C)
28 4605 IFFQ(1,C)=-1THENC=1:GOT
   O4610
9B 4606 C=C+1:GOTO4600
74 4610 INPUT#1,FQ(2,C):INPUT#1
   ,ST(2,C)
19 4615 IFFQ(2,C)=-1THENC=1:GOT
   O4620
FF 4616 C=C+1:GOTO4610
F6 4620 INPUT#1,FQ(3,C):INPUT#1
   ,ST(3,C)
C2 4625 IFFQ(3,C)=-1THEN4630
6E 4626 C=C+1:GOTO4620
D9 4630 CLOSE1:PRINT"[DOWN2]OK"
   :FORI=1TO200:NEXT:N=C:C=0
37 4640 GOTO4800
9F 4800 PRINT"[CLR,WHITE,SPC15,
   RVSON]MUSIC COMPOSER[RVSOFF]
   ":GOTO400
BB 4900 PRINT"[HOME,DOWN6,RIGHT
   17]EXIT MODE":RETURN
E9 5000 GOSUB5010:GOTO5050
FB 5010 PRINT"[CLR]A B C D E F
    G H I  J  K  L  M  N  O"
58 5020 PRINT"1 2 3 4 5 6 7 8 9
    10 11 12 13 14 15"
27 5030 PRINT"[DOWN3]WHICH VOIC
   E? (1-3)"
61 5040 GETA$:IFA$<>"1"ANDA$<>"
   2"ANDA$<>"3"THEN5040
4C 5045 AZ=VAL(A$):RETURN
9E 5050 PRINT"[DOWN4]ENTER ATTA
   CK RATE (A-O)"
49 5060 GETA$:IFA$=""THEN5060
09 5065 X=ASC(A$)-64:IFX<1ORX>1
   5THEN5060
73 5070 IFAZ=1THENA1=X
E3 5080 IFAZ=2THENA2=X
E7 5090 IFAZ=3THENA3=X
F2 5100 GOTO4800
FC 5150 GOSUB5010:PRINT"[DOWN4]
   ENTER DECAY RATE (A-O)"
A7 5210 GETA$:IFA$=""THEN5210
7D 5212 X=ASC(A$)-64:IFX<1ORX>1
   5THEN5210
F7 5220 IFAZ=1THEND1=X
0F 5230 IFAZ=2THEND2=X
17 5240 IFAZ=3THEND3=X
AB 5250 GOTO4800
11 5300 GOSUB5010:PRINT"[DOWN4]
   ENTER SUSTAIN LEVEL (A-O)"
93 5360 GETA$:IFA$=""THEN5360
69 5370 X=ASC(A$)-64:IFX<1ORX>1
   5THEN5360
F9 5380 IFAZ=1THENS1=X
C5 5390 IFAZ=2THENS2=X
B9 5400 IFAZ=3THENS3=X
CA 5410 GOTO4800
8A 5450 GOSUB5010:PRINT"[DOWN4]
   ENTER RELEASE RATE (A-O)"
8B 5510 GETA$:IFA$=""THEN5510
9E 5520 X=ASC(A$)-64:IFX<1ORX>1
   5THEN5520
2F 5530 IFAZ=1THENS1=X
9F 5540 IFAZ=2THENS2=X
4B 5550 IFAZ=3THENS3=X
40 5560 GOTO4800
7E 5600 PRINT"[CLR,SPC13,RVSON]
   TEMPO (SPEED)[RVSOFF]"
21 5620 PRINT"[DOWN]J : VERY SL
   OW":PRINT"I : BROAD":PRINT"H
    : SLOW":PRINT"G : QUITE SLO
   W
E8 5630 PRINT"F : MODERATELY SL
   OW":PRINT"E : MODERATE SPEED
   ":PRINT"D : QUITE FAST"
59 5640 PRINT"C : MERRY AND FAS
   T":PRINT"B : FAST":PRINT"A :
    VERY FAST"
6C 5660 GETA$:IFA$=""THEN5660
79 5670 A=ASC(A$)-64:IFA<1ORA>1
   0THEN5660
2A 5690 TP=A:GOTO4800
53 6000 E1=1:GOTO6040
98 6010 GETA$:IFA$<>"[DOWN]"AND
   A$<>CHR$(13)THEN6010
6C 6020 IFA$=CHR$(13)THEN6200
6A 6030 E1=E1+1:IFE1=7THENE1=1
32 6040 IFE1=1THENPRINT"[HOME,D
   OWN3,RIGHT,RVSON]FREQ. DISPL
   AY[RVSOFF]":GOTO6100
4B 6050 IFE1=2THENPRINT"[HOME,D
   OWN4,RIGHT,RVSON]CHANGE ATTA
   CK[RVSOFF]":GOTO6110
44 6060 IFE1=3THENPRINT"[HOME,D
   OWN5,RIGHT,RVSON]CHANGE DECA
   Y[RVSOFF]":GOTO6120
76 6070 IFE1=4THENPRINT"[HOME,D
   OWN6,RIGHT,RVSON]CHANGE SUSA
   TIN[RVSOFF]":GOTO6130
7F 6080 IFE1=5THENPRINT"[HOME,D
   OWN7,RIGHT,RVSON]CHANGE RELE
   ASE[RVSOFF]":GOTO6140
A8 6090 IFE1=6THENPRINT"[HOME,D
   OWN8,RIGHT,RVSON]CHANGE TEMP
   O[RVSOFF]":GOTO6150
8F 6100 PRINT"[HOME,DOWN8,RIGHT
   ]CHANGE TEMPO":GOTO6010
87 6110 PRINT"[HOME,DOWN3,RIGHT
   ,RVSOFF]FREQ. DISPLAY":GOTO6
   010
5E 6120 PRINT"[HOME,DOWN4,RIGHT
   ]CHANGE ATTACK":GOTO6010
93 6130 PRINT"[HOME,DOWN5,RIGHT
   ]CHANGE DECAY":GOTO6010
23 6140 PRINT"[HOME,DOWN6,RIGHT
   ]CHANGE SUSATIN":GOTO6010
67 6150 PRINT"[HOME,DOWN7,RIGHT
```

```
    ]CHANGE RELEASE":GOTO6010
63  6200 ONE1GOTO20,5000,5150,53
    00,5450,5600
CB  9000 DATA32,121,0,208,3,76,2
    41,192,201,44,240,3,76,67,19
    3,32,115,0
19  9005 DATA162,8,221,76,193,24
    0,6,202,16,248,76,67,193,138
    ,10,170,189,85
2C  9010 DATA193,133,251,189,86,
    193,133,252,32,50,192,76,0,1
    92,108,251,0,32
3E  9015 DATA55,193,201,1,144,4,
    201,4,144,3,76,72,193,202,14
    2,114,193,96
56  9020 DATA32,55,193,10,10,10,
    10,141,123,193,173,120,193,4
    1,15,13,123,193
D2  9025 DATA141,120,193,96,32,5
    5,193,141,123,193,173,120,19
    3,41,240,13,123,193
87  9030 DATA141,120,193,96,32,5
    5,193,10,10,10,10,141,123,19
    3,173,121,193,41
84  9035 DATA15,13,123,193,141,1
    21,193,96,32,55,193,141,123,
    193,173,121,193,41
C3  9040 DATA240,13,123,193,141,
    121,193,96,32,115,0,162,3,22
    1,103,193,240,6
24  9045 DATA202,16,248,76,67,19
    3,224,1,240,6,32,115,0,76,19
    6,192,32,44
B0--9050 DATA193,192,16,144,3,76
    ,72,193,142,117,193,140,118,
    193,162,1,189,107
63  9055 DATA193,141,119,193,96,
    32,44,193,142,115,193,140,11
    6,193,96,32,55,193
77  9060 DATA141,122,193,96,169,
    0,162,24,157,0,212,202,16,25
    0,169,0,141,115
A7  9065 DATA193,141,116,193,76,
    115,0,173,115,193,208,5,173,
    116,193,240,37,174
44  9070 DATA114,193,189,111,193
    ,133,251,169,212,133,252,160
    ,6,185,115,193,145,251
04  9075 DATA136,16,248,160,4,17
    3,119,193,9,1,145,251,173,12
    2,193,141,24,212
3F  9080 DATA96,165,122,208,2,19
    8,123,198,122,76,121,0,32,16
    6,173,32,247,183
67  9085 DATA166,20,164,21,96,32
    ,44,193,152,208,11,224,16,17
    6,7,138,96,162
B6  9090 DATA11,76,58,164,162,14
    ,208,249,86,65,68,83,82,87,7
    0,76,67,53
43  9095 DATA192,72,192,94,192,1
    12,192,134,192,152,192,203,1
    92,213,192,220,192,78
48  9100 DATA80,83,84,128,64,32,
    16,0,7,14,0,0,0,0,0,0,0,0,0,
    0
```

FX EDITOR

PROGRAM: BASIC LOADER

```
E8  10 M1=32768:M2=40960
E4  11 PRINTCHR$(147)
4C  12 POKE53290,0:POKE53281,0:PR
    INT"[YELLOW,CLR,RIGHT11]FX-ED
    ITOR V1.1"
C4  13 PRINT"[RED,RIGHT11]-------
    -- ----"
9D  14 PRINT"[DOWN,CYAN,SPC4]WRIT
    TEN BY ARCHIE 'JOC' LYNCH"
00  15 PRINT"[DOWN,PURPLE,SPC6]DE
    SIGN BY MIKE 'FAX' ELSE"
C4  16 PRINT"[DOWN,C1](C)COPYRIGH
    T 1988  DIGITAL DEVELOPMENTS"
BF  17 PRINT"[DOWN] IN CONJUNCTIO
    N WITH YOUR COMMODORE 89[GREE
    N,DOWN3]"
D0  32 READCODE$
B9  33 LB=ASC(RIGHT$(CODE$,1))-49
    :IFLB>9THENLB=LB-7
CF  34 HB=ASC(LEFT$(CODE$,1))-48:
    IFHB>9THENHB=HB-7
B7  35 PRINTSPC(5)"READING MEMORY
     BLOCK ...";M1:PRINTCHR$(145)
    ;
9E  36 POKEM1,HB*16+LB:M1=M1+1:IF
    M1<M2THEN32
FD  37 SYS65126
1C  38 :
AF  39 ::::::::LES ALLAN - 13.09.
    86:::::::
12  40 :
33  41 DATA 4C,72,8F,EA,EA,EA,EA,
    A9,40,8D,8A,02,20,84,FF,A9
E0  42 DATA 05,8D,85,02,A9,93,20,
    D2,FF,A9,18,8D,18,D0,A9,00
07  43 DATA 8D,54,8F,8D,20,D0,8D,
    21,D0,A9,D8,8D,16,D0,A9,05
93  44 DATA 8D,22,D0,A9,0E,8D,23,
    D0,A2,A0,BD,80,91,9D,FF,03
43  45 DATA CA,D0,F7,A9,00,A2,90,
    85,FB,86,FC,A0,00,B1,FB,C9
B0  46 DATA FF,F0,0B,20,D2,FF,C8,
    D0,F4,E6,FC,4C,4D,80,20,96
35  47 DATA 87,20,1E,8B,20,AE,8E,
    20,75,8B,20,7B,80,20,C6,81
20  48 DATA AD,54,8F,D0,97,20,43,
    81,4C,6A,80,AD,C8,83,8D,C7
09  49 DATA 83,18,69,40,8D,00,70,
    AD,C7,83,0A,0A,0A,0A,A8,A2
88  50 DATA 00,B9,7D,72,9D,31,81,
    C8,E8,E0,10,D0,F4,A2,08,A0
46  51 DATA 05,18,20,F0,FF,A9,02,
    8D,86,02,A2,00,A0,00,BD,31
4E  52 DATA 81,20,FA,80,20,E5,80,
    E8,E0,08,30,F2,A2,0C,A0,07
F1  53 DATA 18,20,F0,FF,A2,08,BD,
    31,81,20,FA,80,20,E5,80,E8
9D  54 DATA E0,0F,30,F2,A2,0F,A0,
    0E,18,20,F0,FF,AD,C7,83,20
A7  55 DATA FA,80,4C,E5,80,AD,30,
    81,20,D2,FF,AD,2F,81,20,D2
8D  56 DATA FF,A9,1D,20,D2,FF,20,
    D2,FF,60,48,4A,4A,4A,4A,29
F2  57 DATA 0F,8D,2D,81,68,29,0F,
    8D,2E,81,AC,2D,81,B9,1D,81
C9  58 DATA 8D,30,81,AC,2E,81,B9,
    1D,81,8D,2F,81,60,30,31,32
07  59 DATA 33,34,35,36,37,38,39,
    41,42,43,44,45,46,00,00,30
B0  60 DATA 30,00,00,00,00,00,00,
    00,00,00,00,00,00,00,00,00
6A  61 DATA 00,20,20,A2,00,A0,00,
    BD,45,05,20,AA,81,0A,0A,0A
33  62 DATA 0A,99,B7,81,BD,46,05,
    20,AA,81,29,0F,19,B7,81,99
D3  63 DATA B7,81,E8,E8,E8,E8,C8,
    C0,09,D0,DC,A2,00,A0,00,BD
C2  64 DATA E7,05,20,AA,81,0A,0A,
    0A,0A,99,BF,81,BD,E8,05,20
FC  65 DATA AA,81,29,0F,19,BF,81,
    99,BF,81,E8,E8,E8,E8,C8,C0
1F  66 DATA 07,D0,DC,AD,C7,83,0A,
    0A,0A,0A,AA,A0,00,B9,B7,81
E4  67 DATA 9D,7D,72,E8,C8,C0,10,
    D0,F4,60,2C,B6,81,F0,01,60
22  68 DATA 29,0F,18,69,09,60,30,
    F0,11,15,67,61,1F,09,2F,40
36  69 DATA 41,81,16,1F,01,FE,AE,
    70,82,BD,71,82,8D,5C,8A,BD
54  70 DATA 8F,82,18,69,05,8D,5D,
    8A,BD,AD,82,18,69,C0,8D,5E
0B  71 DATA 8A,20,E4,FF,C9,89,F0,
    4B,C9,8A,F0,72,C9,8B,F0,68
89  72 DATA C9,8C,F0,67,C9,87,F0,
    47,C9,86,F0,3D,C9,5F,F0,42
1B  73 DATA C9,11,F0,60,C9,1D,F0,
    5F,C9,91,F0,5E,C9,9D,F0,51
B4  74 DATA C9,0D,F0,31,C9,2B,F0,
    1E,C9,2D,F0,20,C9,85,F0,35
04  75 DATA C9,58,F0,22,C9,5A,F0,
    24,C9,88,F0,26,C9,51,F0,3D
63  76 DATA 4C,CB,82,4C,EB,8F,4C,
    98,83,4C,16,87,4C,A8,83,4C
F5  77 DATA D9,8A,4C,B9,83,60,20,
    43,8A,4C,C6,81,20,4C,8A,4C
2E  78 DATA C6,81,4C,9D,8D,4C,C9,
    83,4C,5C,8D,4C,19,8D,4C,E7
44  79 DATA 8C,4C,86,83,4C,3D,83,
    4C,61,83,4C,73,83,4C,BF,8F
07  80 DATA 0D,3E,46,5E,66,7E,86,
    9E,A6,BE,C6,DE,E6,FE,06,1E
E1  81 DATA 26,4E,56,6E,76,8E,96,
    AE,B6,CE,D6,EE,F6,0E,16,70
E7  82 DATA 70,70,70,70,70,70,70,
    70,70,70,70,70,70,70,70,90
49  83 DATA 90,90,90,90,90,90,90,
    90,90,90,90,90,90,00,00,00
46  84 DATA 00,00,00,00,00,00,00,
    00,00,00,01,01,01,00,00,00
62  85 DATA 00,00,00,00,00,00,00,
    00,00,01,01,A2,00,DD,2D,83
3B  86 DATA F0,08,E8,E0,10,D0,F5,
    4C,C6,81,48,AE,70,82,BD,F1
81  87 DATA 82,A8,BD,0F,83,AA,18,
    20,F0,FF,68,20,D2,FF,4C,C6
3E  88 DATA 81,05,06,09,0A,0D,0E,
    11,12,15,16,19,1A,1D,1E,21
5F  89 DATA 22,07,09,0B,0C,0F,10,
    13,14,17,18,1B,1C,1F,20,08
F6  90 DATA 08,08,08,08,09,08,08,
    08,08,08,08,08,09,08,08,0C
5F  91 DATA 0C,0C,0C,0C,0C,0C,0C,
    0C,0C,0C,0C,0C,0C,30,31,32
A3  92 DATA 33,34,35,36,37,38,39,
    41,42,43,44,45,46,AD,70,82
88  93 DATA C9,01,F0,04,C9,00,D0,
    09,18,69,10,8D,70,82,4C,C6
86  94 DATA 81,AD,70,82,C9,10,10,
    06,18,69,0E,8D,70,82,4C,C6
62  95 DATA 81,EE,70,82,AD,70,82,
    C9,1E,D0,F3,A9,00,8D,70,82
31  96 DATA 4C,C6,81,AD,70,82,C9,
    10,30,E4,AD,70,82,38,E9,0E
C9  97 DATA 8D,70,82,4C,C6,81,CE,
    70,82,AD,70,82,C9,FF,D0,CE
F8  98 DATA A9,1D,8D,70,82,4C,C6,
    81,EE,C8,83,AD,C8,83,C9,10
FA  99 DATA D0,05,A9,00,8D,C8,83,
    60,CE,C8,83,AD,C8,83,C9,FF
25  100 DATA D0,F5,A9,0F,8D,C8,83
    ,60,00,AD,8A,02,49,C0,8D,8A
BD  101 DATA 02,4C,C6,81,60,00,00
    ,00,00,A9,05,8D,86,02,A2,0F
9A  102 DATA A0,1A,18,20,F0,FF,A2
    ,00,BD,AE,84,20,D2,FF,E8,E0
73  103 DATA 07,D0,F5,AD,5C,8A,8D
    ,F0,7F,AD,5D,8A,8D,F1,7F,AD
A6  104 DATA 5E,8A,8D,F2,7F,A9,FF
    ,8D,1D,D0,A9,2E,8D,5C,8A,A9
18  105 DATA AD,8D,5D,8A,A9,C1,8D
    ,5E,8A,A9,02,8D,86,02,A9,20
73  106 DATA 8D,BC,84,8D,BD,84,A9
    ,00,8D,BF,84,20,99,84,20,E4
B0  107 DATA FF,F0,F9,A2,00,DD,2D
    ,83,F0,0B,E8,E0,10,D0,F6,4C
90  108 DATA 1B,84,AC,BF,84,99,BC
    ,84,EE,BF,84,AD,BF,84,C9,02
78  109 DATA D0,D9,20,99,84,20,E4
    ,FF,F0,FB,C9,14,F0,C0,C9,0D
5F  110 DATA F0,03,4C,45,84,AD,BC
    ,84,20,AA,81,0A,0A,0A,0A,8D
19  111 DATA BF,84,AD,BD,84,20,AA
    ,81,29,0F,0D,BF,84,A8,AD,F0
0F  112 DATA 7F,8D,5C,8A,AD,F1,7F
    ,8D,5D,8A,AD,F2,7F,8D,5E,8A
89  113 DATA A9,FE,8D,1D,D0,AD,73
    ,88,F0,06,A9,00,8D,73,88,60
26  114 DATA 98,0A,0A,0A,0A,A8,4C
    ,8F,80,A2,0F,A0,23,18,20,F0
F6  115 DATA FF,AD,BC,84,20,D2,FF
```

```
    ,AD,BD,84,20,D2,FF,60,45,46
AE  116 DATA 46,45,43,54,20,20,42
    ,41,4E,4B,20,20,30,30,20,00
34  117 DATA A0,00,AD,86,02,48,A9
    ,0B,8D,86,02,A9,4E,8D,5C,8A
A7  118 DATA A9,00,8D,FF,03,AD,10
    ,D0,29,FE,8D,5E,8A,AD,1D,D0
E2  119 DATA 29,FE,8D,1D,D0,A9,C5
    ,8D,5D,8A,AD,15,D0,09,01,8D
F4  120 DATA 15,D0,AD,17,89,29,10
    ,D0,08,A9,08,8D,88,02,4C,06
21  121 DATA 85,A9,04,8D,88,02,20
    ,E4,FF,F0,E7,C9,1D,D0,0D,A9
E1  122 DATA 01,8D,FF,03,A9,E5,8D
    ,5C,8A,4C,F2,84,C9,9D,D0,0D
F4  123 DATA A9,00,8D,FF,03,A9,4E
    ,8D,5C,8A,4C,F2,84,C9,0D,F0
73  124 DATA 14,C9,58,D0,06,20,43
    ,8A,4C,F2,84,C9,5A,D0,B3,20
94  125 DATA 4C,8A,4C,F2,84,AD,B8
    ,89,D0,08,A9,11,8D,FE,85,4C
57  126 DATA 57,85,A9,12,8D,FE,85
    ,20,5D,85,4C,C0,86,AD,FF,03
5E  127 DATA 29,03,A8,B9,B3,86,8D
    ,97,85,B9,B6,86,8D,98,85,B9
F2  128 DATA B0,86,8D,00,86,B9,BA
    ,86,8D,A8,85,B9,BD,86,8D,A9
2A  129 DATA 85,A2,06,A9,2E,9D,9C
    ,86,CA,10,FA,A9,00,8D,15,86
73  130 DATA 4C,FD,85,AC,15,86,B9
    ,00,40,8D,5C,8A,AD,BE,86,8D
92  131 DATA 5D,8A,AD,10,D0,29,FE
    ,19,00,40,8D,5E,8A,20,E4,FF
C4  132 DATA F0,E1,C9,0D,D0,01,60
    ,C9,14,D0,20,AD,15,86,C9,00
D1  133 DATA D0,06,A9,2E,AC,15,86
    ,99,9C,86,4C,FD,85,AC,15,86
AE  134 DATA A9,2E,99,9C,86,CE,15
    ,86,4C,FD,85,A2,00,DD,16,86
76  135 DATA F0,08,E8,E0,37,D0,F6
    ,4C,93,85,AC,15,86,99,9C,86
C3  136 DATA EE,15,86,AD,15,86,C9
    ,0C,D0,03,CE,15,86,A2,12,A0
09  137 DATA 1A,18,20,F0,FF,A2,00
    ,BD,9C,86,20,D2,FF,E8,E0,0C
8E  138 DATA D0,F5,4C,93,85,00,41
    ,42,43,44,45,46,47,48,49,4A
75  139 DATA 4B,4C,4D,4E,4F,50,51
    ,52,53,54,55,56,57,58,59,5A
80  140 DATA 30,31,32,33,34,35,36
    ,37,38,39,21,23,24,25,26,27
C3  141 DATA 28,29,3A,3B,2E,2C,3F
    ,2F,2A,2D,2B,20,22,E6,EE,F6
C3  142 DATA FE,07,0F,17,1F,27,2F
    ,37,3F,47,4E,56,5E,66,6E,76
C6  143 DATA 7E,86,8E,96,9E,A6,AE
    ,4E,56,5E,66,6E,76,7E,86,8E
55  144 DATA 96,9E,A6,AE,00,00,00
    ,00,00,00,00,00,00,00,00,00
72  145 DATA 00,00,00,00,00,00,00
    ,00,00,00,00,00,00,00,C5,00
2C  146 DATA 00,00,00,01,01,01,01
    ,01,01,01,01,01,2E,2E,2E,2E
E4  147 DATA 2E,2E,2E,2E,2E,2E,2E
    ,2E,2E,2E,2E,2E,2E,2E,2E,2E
24  148 DATA 07,1A,07,5A,4D,67,86
    ,86,86,00,74,8F,81,86,86,86
BF  149 DATA AD,B8,83,AC,B9,89,F0
    ,09,C9,32,D0,02,A9,FF,18,69
B7  150 DATA 01,8D,B9,86,A2,28,20
    ,99,8A,86,FB,98,18,69,40,85
D9  151 DATA FC,AD,FF,03,F0,10,A5
    ,FB,18,69,1A,85,FB,A5,FC,69
55  152 DATA 00,85,FC,4C,00,87,A5
    ,FB,18,69,07,85,FB,4C,ED,86
B9  153 DATA A0,0B,B9,9C,86,29,3F
    ,91,FB,88,10,F6,68,8D,86,02
3D  154 DATA A9,04,8D,88,02,60,A2
    ,0F,A0,1A,18,20,F0,FF,A9,05
18  155 DATA 8D,86,02,A2,00,BD,B5
    ,84,20,D2,FF,E8,E0,07,D0,F5
87  156 DATA 20,C0,84,AD,FF,03,F0
    ,05,A9,33,4C,3F,87,A9,00,18
31  157 DATA 6D,74,8B,A2,10,20,99
    ,8A,86,FB,18,69,48,85,FC,AD
0F  158 DATA C7,83,0A,0A,0A,0A,AA
    ,A0,00,BD,7D,72,91,FB,E8,C8
D0  159 DATA C0,0F,D0,F5,91,FB,50
    ,CE,95,87,AD,95,87,F0,01,60
33  160 DATA A9,05,8D,95,87,EE,8C
    ,87,AD,8C,87,C9,08,D0,05,A9
5A  161 DATA 00,8D,8C,87,AA,BD,8D
    ,87,8D,27,D0,60,00,00,06,0E
12  162 DATA 0C,01,0C,08,06,04,78
    ,AD,BB,87,8D,14,03,AD,BC,87
F6  163 DATA 8D,15,03,A2,00,8E,2E
    ,DC,E8,8E,1A,D0,A9,00,8D,12
17  164 DATA D0,AD,11,D0,29,7F,8D
    ,11,D0,58,60,BD,87,A9,01,8D
FB  165 DATA 19,D0,8D,1A,D0,EE,7B
    ,88,AD,7B,88,C9,03,D0,05,A9
62  166 DATA 00,8D,7B,88,AA,BD,72
    ,88,8D,12,D0,BD,75,88,8D,E9
43  167 DATA 87,8D,78,88,8D,EA,87
    ,78,20,43,88,58,4C,31,EA,A9
FA  168 DATA 1F,8D,11,D0,A9,18,8D
    ,18,D0,A9,D8,8D,16,D0,20,2C
38  169 DATA 88,20,1B,89,60,A9,18
    ,8D,11,D0,20,67,87,20,06,70
B3  170 DATA 60,AD,41,8A,F0,08,A9
    ,00,8D,41,8A,4C,08,8A,AD,42
D8  171 DATA 8A,F0,08,A9,00,8D,42
    ,8A,4C,D6,89,60,AD,1A,89,F0
17  172 DATA 11,AD,19,89,8D,7C,88
    ,AD,18,89,8D,17,89,A9,00,8D
69  173 DATA 1A,89,60,AD,11,D0,29
    ,F0,0D,7C,88,8D,11,D0,8D,FF
E9  174 DATA 9F,AD,17,89,8D,18,D0
    ,A9,C8,8D,16,D0,AD,5C,8A,8D
E1  175 DATA 00,D0,AD,5D,8A,8D,01
    ,D0,AD,5E,8A,8D,10,D0,20,11
64  176 DATA 88,60,30,BE,FE,EF,05
    ,43,87,88,88,02,07,A2,00,BD
35  177 DATA A8,06,9D,D0,0A,BD,F8
    ,06,9D,20,0B,E8,E0,D0,D0,EF
E7  178 DATA AD,18,89,49,30,8D,18
    ,89,AD,A8,0A,38,E9,01,C9,FF
8A  179 DATA D0,02,A9,32,8D,74,8B
    ,60,A2,00,BD,A8,0A,9D,D0,06
BE  180 DATA BD,F8,0A,9D,20,07,E8
    ,E0,D0,D0,EF,AD,18,89,49,30
09  181 DATA 8D,18,89,AD,A8,06,38
    ,E9,01,C9,FF,D0,02,A9,32,8D
2A  182 DATA 74,8B,60,A2,00,BD,D0
    ,06,9D,A8,0A,BD,20,07,9D,F8
AB  183 DATA 0A,E8,E0,D0,D0,EF,AD
    ,18,89,49,30,8D,18,89,AD,A8
F1  184 DATA 0A,8D,74,8B,60,A2,00
    ,BD,D0,0A,9D,A8,06,BD,20,0B
35  185 DATA 9D,F8,06,E8,E0,D0,D0
    ,EF,AD,18,89,49,30,8D,18,89
FC  186 DATA AD,A8,06,8D,74,8B,60
    ,18,18,07,00,AD,1A,89,F0,01
16  187 DATA 60,AD,C5,83,D0,01,60
    ,AD,C6,83,D0,03,4C,CA,89,4C
A0  188 DATA B9,89,A9,01,8D,B8,89
    ,EE,19,89,AD,19,89,C9,08,D0
79  189 DATA 30,29,07,8D,19,89,A9
    ,00,8D,C5,83,CE,B8,83,AD,B8
4A  190 DATA 83,C9,FF,D0,05,A9,32
    ,8D,B8,83,EA,AD,18,89,29,10
16  191 DATA F0,09,20,7D,88,EE,42
    ,8A,4C,71,89,20,A8,88,EE,42
31  192 DATA 8A,EE,1A,89,60,A9,00
    ,8D,B8,89,CE,19,89,AD,19,89
6B  193 DATA C9,FF,D0,30,29,07,8D
    ,19,89,A9,00,8D,C5,83,EE,B8
BC  194 DATA 83,AD,B8,83,C9,33,D0
    ,05,A9,00,8D,B8,83,EA,AD,18
58  195 DATA 89,29,10,F0,09,20,D3
    ,88,EE,41,8A,4C,71,89,20,F5
C9  196 DATA 88,EE,41,8A,EE,1A,89
    ,60,00,AD,B8,89,C9,00,D0,07
0F  197 DATA 20,32,89,EE,C5,83,60
    ,4C,32,89,AD,B8,89,C9,01,D0
95  198 DATA 07,20,75,89,EE,C5,83
    ,60,4C,75,89,EA,AD,B8,83,A2
07  199 DATA 28,20,99,8A,86,FB,98
    ,18,69,40,85,FC,A9,06,8D,03
AD  200 DATA 8A,AD,17,89,29,10,F0
    ,05,A9,0A,8D,03,8A,A0,27,B1
2C  201 DATA FB,99,A8,0A,88,10,F8
    ,60,EA,AD,B8,83,18,69,07,C9
42  202 DATA 33,30,03,38,E9,33,A2
    ,28,20,99,8A,86,FB,84,FC,98
6B  203 DATA 18,69,40,85,FC,A9,07
    ,8D,3C,8A,AD,17,89,29,10,F0
F7  204 DATA 05,A9,0B,8D,3C,8A,A0
    ,27,B1,FB,99,C0,07,88,10,F8
E7  205 DATA 60,00,00,A9,00,8D,C6
    ,83,EE,C5,83,60,A9,01,8D,C6
EE  206 DATA 83,EE,C5,83,60,48,78
    ,A8,D8,18,00,30,06,75,C1,78
BC  207 DATA A9,F0,8D,1A,D0,A9,01
    ,8D,0E,DC,A9,1B,8D,11,D0,A9
EC  208 DATA 31,8D,14,03,A9,EA,8D
    ,15,03,A9,00,8D,FE,03,A9,04
76  209 DATA 8D,88,02,A9,01,8D,27
    ,D0,A9,18,8D,18,D0,A9,00,8D
EC  210 DATA 15,D0,A9,C8,8D,16,D0
    ,58,60,8E,D7,8A,8D,D8,8A,A9
54  211 DATA 00,8D,D6,8A,8D,D4,8A
    ,8D,D5,8A,A0,08,4E,D8,8A,90
00  212 DATA 13,AD,D4,8A,18,6D,D7
    ,8A,8D,D4,8A,AD,D5,8A,6D,D6
B1  213 DATA 8A,8D,D5,8A,0E,D7,8A
    ,2E,D6,8A,88,D0,DF,AE,D4,8A
AA  214 DATA AC,D5,8A,60,18,01,28
    ,00,00,A2,0F,A0,1A,18,20,F0
C3  215 DATA FF,A9,05,8D,86,02,A2
    ,00,BD,B5,84,20,D2,FF,E8,E0
5E  216 DATA 07,D0,F5,A9,02,8D,86
    ,02,EE,73,8B,20,E3,83,98,A2
08  217 DATA 10,20,99,8A,86,FB,98
    ,18,69,48,85,FC,AD,C7,83,A0
42  218 DATA 00,B1,FB,99,31,81,C8
    ,C0,10,D0,F6,4C,9D,80,A2,0E
47  219 DATA BD,64,8B,9D,02,D0,CA
    ,10,F7,A9,FF,8D,15,D0,A2,07
55  220 DATA A9,0E,9D,F8,07,9D,F8
    ,0B,9D,27,D0,CA,D0,F2,A9,0D
7D  221 DATA 8D,F8,07,8D,F8,0B,A9
    ,FE,8D,1D,D0,8D,1C,D0,A9,06
24  222 DATA 8D,26,D0,A9,03,8D,25
    ,D0,A2,80,BD,7F,9F,9D,40,03
3B  223 DATA CA,10,F7,60,18,BE,48
    ,BE,78,BE,A8,BE,D8,BE,08,BE
76  224 DATA 28,BE,C0,00,00,A2,27
    ,BD,99,8B,9D,80,DA,9D,A8,DA
25  225 DATA 9D,D0,DA,9D,F8,DA,9D
    ,20,DB,9D,48,DB,9D,70,DB,9D
21  226 DATA 98,DB,9D,C0,DB,CA,10
    ,DF,60,00,00,02,05,05,02,00
F3  227 DATA 0B,0B,0B,0B,0B,0B,0B
    ,0B,0B,0B,0B,0B,00,00,02,05
5A  228 DATA 05,02,00,0B,0B,0B,0B
    ,0B,0B,0B,0B,0B,0B,0B,0B,A9
C7  229 DATA 05,8D,86,02,20,5F,8A
    ,EE,54,8F,A9,01,8D,15,D0,A9
11  230 DATA 13,20,D2,FF,A2,00,BD
    ,61,8C,20,D2,FF,E8,E0,0C,D0
2E  231 DATA F5,A9,0B,8D,86,02,A9
    ,66,8D,00,D0,A9,40,8D,01,D0
51  232 DATA A9,01,8D,15,D0,A9,00
    ,8D,81,8C,A2,12,A9,2D,9D,6D
A7  233 DATA 8C,CA,10,FA,20,BB,8C
    ,20,E4,FF,A2,00,DD,82,8C,F0
02  234 DATA 10,E8,E0,39,D0,F6,C9
    ,14,F0,20,C9,0D,F0,3D,4C,07
67  235 DATA 8C,AE,81,8C,9D,6D,8C
    ,20,BB,8C,AD,81,8C,C9,13,F0
C2  236 DATA D6,EE,81,8C,20,D1,8C
    ,4C,07,8C,AC,81,8C,A9,2D,99
44  237 DATA 6D,8C,88,A9,2D,99,6D
    ,8C,20,BB,8C,AD,81,8C,C9,00
46  238 DATA F0,B5,CE,81,8C,20,DB
    ,8C,4C,07,8C,A9,00,8D,15,D0
F4  239 DATA 60,0D,0D,46,49,4C,45
    ,4E,41,4D,45,2D,3E,42,41,4E
EB  240 DATA 4B,2D,2D,2D,2D,2D,2D
    ,2D,2D,2D,2D,2D,2D,2D,2D,2D
49  241 DATA 20,04,40,30,31,32,33
    ,34,35,36,37,38,39,41,42,43
CB  242 DATA 44,45,46,47,48,49,4A
    ,4B,4C,4D,4E,4F,50,51,52,53
D2  243 DATA 54,55,56,57,58,59,5A
    ,21,23,24,25,26,27,28,29,2B
01  244 DATA 2A,3A,3B,2C,2E,3C,3E
    ,3F,3D,5C,20,A0,0A,A2,02,18
73  245 DATA 20,F0,FF,A2,00,BD,6D
    ,8C,20,D2,FF,E8,E0,13,D0,F5
26  246 DATA 60,AD,00,D0,18,69,08
```

```
   ,8D,00,D0,60,AD,00,D0,38,E9
6C 247 DATA 08,8D,00,D0,60,6D,8C
   ,A2,00,BD,12,8D,20,D2,FF,E8
53 248 DATA E0,07,D0,F5,20,BF,85
   ,A9,08,AA,A8,20,BA,FF,AC,E6
BF 249 DATA 8C,AE,E5,8C,AD,81,8C
   ,20,BD,FF,A9,00,20,D5,FF,4C
59 250 DATA 60,97,93,9E,00,4C,4F
   ,41,44,A2,00,BD,50,8D,20,D2
0A 251 DATA FF,E8,E0,0C,D0,F5,20
   ,BF,8B,A9,08,AA,A8,20,BA,FF
0B 252 DATA AC,E6,8C,AE,E5,8C,AD
   ,81,8C,20,BD,FF,A9,40,85,FC
E4 253 DATA A9,00,85,FB,A2,FF,A0
   ,4F,A9,FB,20,D8,FF,4C,60,97
53 254 DATA 93,9E,00,53,41,56,45
   ,20,42,41,4E,4B,A2,00,BD,93
13 255 DATA 8D,20,D2,FF,E8,E0,0A
   ,D0,F5,20,BF,8B,A9,08,AA,A8
E3 256 DATA 20,BA,FF,AC,E6,8C,AE
   ,E5,8C,AD,81,8C,20,BD,FF,A9
F9 257 DATA 72,85,FC,A9,7D,85,FB
   ,A2,7D,A0,73,A9,FB,20,D8,FF
A2 258 DATA 4C,60,97,93,9E,00,53
   ,41,56,45,20,46,58,A9,05,8D
F3 259 DATA 86,02,A2,0F,A0,15,18
   ,20,F0,FF,A2,00,BD,11,8F,20
83 260 DATA D2,FF,E8,E0,0C,D0,F5
   ,EE,73,8B,20,E3,83,8C,1D,8F
1E 261 DATA 20,5F,8A,20,1E,8F,A9
   ,C8,8D,16,D0,A2,00,BD,93,8D
62 262 DATA 20,D2,FF,E8,E0,0A,D0
   ,F5,20,BF,8B,A9,00,85,3F,A9
38 263 DATA 70,85,40,A9,7D,85,41
   ,A9,73,85,42,A9,00,85,FE,AD
64 264 DATA 1D,8F,85,FF,20,DF,8E
   ,20,60,97,4C,55,8F,A9,00,8D
92 265 DATA 74,8E,A9,33,8D,75,8E
   ,A9,40,85,FC,A9,00,85,FB,AD
28 266 DATA 74,8E,4A,4A,4A,4A,29
   ,0F,AA,BD,9E,8E,8D,79,8E,AD
28 267 DATA 74,8E,29,0F,AA,BD,9E
   ,8E,8D,7A,8E,AD,75,8E,4A,4A
67 268 DATA 4A,4A,29,0F,AA,BD,9E
   ,8E,8D,8C,8E,AD,75,8E,29,0F
BE 269 DATA AA,BD,9E,8E,8D,8D,8E
   ,AD,74,8E,8D,76,8E,A0,00,B9
11 270 DATA 76,8E,91,FB,C8,C0,28
   ,D0,F6,A5,FB,18,69,28,85,FB
DB 271 DATA A5,FC,69,00,85,FC,EE
   ,74,8E,EE,75,8E,AD,74,8E,C9
D1 272 DATA 33,D0,9C,60,33,66,32
   ,20,1B,33,32,1D,20,2E,2E,2E
7F 273 DATA 2E,2E,2E,2E,2E,2E,2E
   ,2E,2E,20,20,1B,36,35,1D,20
1F 274 DATA 2E,2E,2E,2E,2E,2E,2E
   ,2E,2E,2E,2E,2E,20,20,30,31
BD 275 DATA 32,33,34,35,36,37,38
   ,39,01,02,03,04,05,06,A0,00
85 276 DATA A9,E0,85,FF,A9,00,85
   ,FE,B1,FE,91,FE,E6,FE,D0,F8
32 277 DATA E6,FF,D0,F4,A9,FE,8D
   ,1B,F6,8D,8C,F7,A9,FF,8D,20
9C 278 DATA F6,8D,91,F7,A9,FC,8D
   ,96,F7,A9,FD,8D,9B,F7,60,A9
07 279 DATA 35,85,01,A9,01,A2,08
   ,A0,01,20,BA,FF,AD,81,8C,AE
D3 280 DATA E5,8C,AC,E6,8C,20,BD
   ,FF,A6,41,A4,42,A9,3F,20,D8
D9 281 DATA FF,90,03,8D,AC,02,20
   ,B7,FF,8D,AD,02,A9,37,85,01
1B 282 DATA 60,46,58,20,53,41,56
   ,45,20,41,44,44,52,00,A9,70
20 283 DATA A2,00,85,FC,86,FB,A0
   ,00,B1,FB,C9,70,30,0E,C9,74
94 284 DATA 10,0A,B1,FB,29,0F,18
   ,6D,1D,8F,91,FB,A5,FB,18,69
74 285 DATA 01,85,FB,A5,FC,69,00
   ,85,FC,C9,72,D0,DE,A5,FB,C9
F1 286 DATA 49,D0,D5,60,00,A2,00
   ,BD,21,92,9D,00,70,BD,21,93
57 287 DATA 9D,00,71,E8,D0,F1,BD
   ,21,94,9D,00,72,E8,E0,7D,D0
65 288 DATA F5,60,A2,79,A9,00,85
   ,FB,A9,04,85,FC,A0,00,A9,00
5C 289 DATA 91,FB,C8,D0,FB,E6,FC
   ,CA,D0,F6,20,55,8F,20,FD,8D
15 290 DATA A2,08,A9,A0,85,FB,A9
   ,94,85,FC,A9,00,85,FD,A9,20
A5 291 DATA 85,FE,A0,00,B1,FB,91
   ,FD,C8,D0,F9,E6,FC,E6,FE,CA
1D 292 DATA D0,F2,A2,07,A9,39,9D
   ,E8,22,CA,10,F8,4C,03,80,EE
A2 293 DATA 54,8F,20,5F,8A,A9,D8
   ,8D,16,D0,A9,68,85,FB,A9,9C
B1 294 DATA 85,FC,A0,00,B1,FB,C9
   ,FF,F0,0B,20,D2,FF,C8,D0,F4
72 295 DATA E6,FC,4C,D4,8F,20,E4
   ,FF,F0,FB,60,20,5F,8A,EE,54
56 296 DATA 8F,A9,C8,8D,16,D0,4C
   ,D0,96,EA,EA,EA,EA,EA,EA,EA
9B 297 DATA 13,0D,0D,0D,0D,97,3F
   ,3F,3F,3F,3F,3F,3F,3F,3F,3F
CC 298 DATA 3F,3F,3F,3F,3F,3F,3F
   ,3F,3F,3F,3F,3F,3F,3F,3F,3F
0F 299 DATA 3F,3F,3F,3F,3F,3F,3F
   ,3F,3F,3F,3F,3F,3F,3F,0D,9C
5A 300 DATA 1D,1D,1D,1D,1D,50,49
   ,54,43,48,31,20,20,50,49,54
04 301 DATA 43,48,32,20,57,41,56
   ,45,20,20,41,44,53,52,20,20
1C 302 DATA 20,50,49,0D,97,1D,1D
   ,1D,1D,B0,C0,C0,C0,C0,C0,C0
A7 303 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,C0,C0,C0,C0
D3 304 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,AE,0D,1D,1D,1D,1D,DD,96
A5 305 DATA 1D,1D,1D,1D,1D,1D,1D
   ,1D,1D,1D,1D,1D,1D,1D,1D,1D
92 306 DATA 1D,1D,1D,1D,1D,1D,1D
   ,1D,1D,1D,1D,1D,1D,1D,97,DD
BD 307 DATA 0D,97,1D,1D,1D,1D,AD
   ,C0,C0,C0,C0,C0,C0,C0,C0
AA 308 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,C0,C0,C0,C0
4B 309 DATA C0,C0,C0,C0,C0,BD,0D
   ,1D,1D,1D,1D,1D,1D,1D,9C,53
BB 310 DATA 50,20,20,57,41,56,45
   ,2D,53,20,20,50,53,20,20,4C
7D 311 DATA 45,4E,47,54,48,20,20
   ,52,44,0D,97,1D,1D,1D,1D,1D
11 312 DATA 1D,B0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,C0,C0,C0,C0
7D 313 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,AE,0D,1D,1D
1F 314 DATA 1D,1D,1D,1D,DD,96,1D
   ,1D,1D,1D,1D,1D,1D,1D,1D,1D
33 315 DATA 1D,1D,1D,1D,1D,1D,1D
   ,1D,1D,1D,1D,1D,1D,1D,1D,1D
1E 316 DATA 97,DD,0D,97,1D,1D,1D
   ,1D,1D,1D,AD,C0,C0,C0,C0,C0
31 317 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,C0,C0,C0,C0
75 318 DATA C0,C0,C0,C0,C0,BD,0D
   ,11,1D,1D,1D,1E,46,59,20,4E
52 319 DATA 55,4D,42,45,52,20,3A
   ,20,1D,1D,1D,1D,1D,1D,43,4F
36 320 DATA 50,59,20,4E,55,4D,42
   ,45,52,20,3A,20,1D,1D,0D,0D
B1 321 DATA FF,20,20,20,20,20,20
   ,20,20,20,C0,C1,C2,20,20,20
3B 322 DATA 20,20,20,20,20,20,20
   ,20,20,E8,EC,ED,F3,F4,20,20
3B 323 DATA 20,20,20,20,20,20,20
   ,20,20,20,20,20,20,20,20,20
0A 324 DATA 20,20,C3,C4,C5,C6,C7
   ,C8,C9,CA,CB,CC,CD,CE,E7,EB
80 325 DATA E9,EE,EF,F0,F5,F6,F7
   ,F8,20,20,20,20,20,20,20,20
08 326 DATA 20,20,20,20,20,20,20
   ,20,20,C0,C1,C2,20,20,20,20
D8 327 DATA 20,20,20,20,20,20,20
   ,20,EA,20,F1,F2,20,20,20,20
3E 328 DATA 20,20,20,20,20,20,20
   ,20,20,20,20,20,20,20,20,20
BB 329 DATA 20,C3,C4,C5,CF,D0,D1
   ,D2,D3,D4,D5,D6,D7,D8,D9,DA
74 330 DATA DB,DC,DD,DE,DF,E0,E1
   ,E2,E3,20,20,20,20,20,20,20
CC 331 DATA 20,FF,FF,FF,4C,36,71
   ,A9,1F,8D,18,D4,AD,F3,71,49
CC 332 DATA 01,8D,F3,71,A2,02,8E
   ,34,72,8D,30,72,8D,35,72,A8
D5 333 DATA BD,00,70,0A,90,03,4C
   ,2F,71,10,03,4C,4B,71,DE,F7
B3 334 DATA 71,30,03,4C,CC,70,BD
   ,09,72,9D,F7,71,DE,18,72,BD
F5 335 DATA 12,72,A8,B9,36,72,8D
   ,52,70,B9,3E,72,8D,53,70,BC
47 336 DATA F4,71,B9,49,93,AC,35
   ,72,C9,FF,D0,07,A9,00,9D,F4
FD 337 DATA 71,F0,EC,10,12,BD,24
   ,72,9D,21,72,BD,2A,72,9D,27
DA 338 DATA 72,FE,F4,71,4C,4E,70
   ,FE,F4,71,C9,01,F0,07,C9,02
B9 339 DATA F0,1F,4C,B9,70,18,BD
   ,21,72,7D,FA,71,9D,21,72,99
E3 340 DATA 00,D4,BD,27,72,7D,FD
   ,71,9D,27,72,99,01,D4,4C,B9
CE 341 DATA 70,38,BD,21,72,FD,FA
   ,71,9D,21,72,99,00,D4,BD,27
7A 342 DATA 72,FD,FD,71,9D,27,72
   ,99,01,D4,18,BD,FA,71,7D,00
6D 343 DATA 72,9D,FA,71,BD,FD,71
   ,7D,03,72,9D,FD,71,BD,0E,72
CD 344 DATA 10,13,AD,F3,71,29,01
   ,F0,C6,BD,0C,72,4C,E1,70,BD
E7 345 DATA 1E,72,9D,2D,72,BD,05
   ,72,0A,10,1C,BD,15,72,F0,09
B0 346 DATA DE,15,72,BD,0F,72,4C
   ,03,71,BD,06,72,29,BF,9D,06
BF 347 DATA 72,BD,1E,72,9D,2D,72
   ,BD,18,72,D0,0D,A9,00,99,04
AE 348 DATA D4,A9,FF,9D,00,70,4C
   ,2F,71,BD,1B,72,4A,DD,18,72
B5 349 DATA B0,06,BD,2D,72,4C,2C
   ,71,BD,2D,72,29,FE,99,04,D4
09 350 DATA CA,30,03,4C,15,70,60
   ,AA,BC,30,72,A9,FF,9D,00,70
51 351 DATA A9,00,99,04,D4,99,05
   ,D4,99,06,D4,60,A9,00,9D,F4
0B 352 DATA 71,8D,17,D4,9D,F7,71
   ,99,04,D4,99,06,D4,BD,00,70
6E 353 DATA 29,0F,9D,00,70,0A,0A
   ,0A,0A,A8,8C,33,72,B9,7D,72
53 354 DATA 9D,FA,71,B9,7E,72,9D
   ,FD,71,B9,8A,72,9D,00,72,B9
C2 355 DATA 8B,72,9D,03,72,B9,85
   ,72,9D,06,72,29,0F,9D,09,72
B6 356 DATA B9,86,72,9D,0C,72,B9
   ,87,72,9D,0F,72,B9,88,72,48
20 357 DATA 4A,4A,4A,4A,9D,12,72
   ,68,29,0F,9D,15,72,B9,89,72
F2 358 DATA 9D,18,72,9D,1B,72,B9
   ,81,72,9D,1E,72,B9,84,72,0A
19 359 DATA 18,69,BE,9D,21,72,9D
   ,24,72,B9,84,72,0A,18,69,AF
7B 360 DATA 9D,27,72,AE,33,72,AC
   ,35,72,A9,05,8D,33,72,BD,7D
07 361 DATA 72,99,00,D4,E9,C9,CE
   ,33,72,10,F3,AC,35,72,AE,34
A4 362 DATA 72,4C,2F,71,00,00,00
   ,00,00,00,00,00,00,00,00,00
E3 363 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
EA 364 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,40,60,8F,00
E1 365 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
AC 366 DATA 00,00,07,0E,00,00,00
   ,46,4D,4F,56,59,5B,66,6A,72
CB 367 DATA 72,72,72,72,72,72,72
   ,01,01,01,01,02,02,FF,01,FF
14 368 DATA 01,01,01,01,01,80,FF
   ,02,01,FF,02,FF,01,01,01,01
66 369 DATA 01,02,02,02,02,02,FF
   ,02,02,80,FF,01,01,01,01,02
69 370 DATA 02,FF,20,20,20,20,20
   ,20,20,20,20,20,20,20,01,EA
3F 371 DATA 3C,66,6E,6E,70,72,3C
   ,00,7C,C6,C6,FE,E6,E6,E6,00
7A 372 DATA FC,C6,C6,FC,E6,E6,FC
   ,00,7C,C6,C0,E0,E0,E6,7C,00
AC 373 DATA FC,C6,C6,E6,E6,E6,FC
   ,00,FE,C0,C0,F8,E0,E0,FE,00
DE 374 DATA FE,C0,C0,F8,E0,E0,E0
   ,00,7C,C6,C0,EE,E6,E6,7C,00
28 375 DATA C6,C6,C6,FE,E6,E6,E6
   ,00,18,18,18,38,38,38,3C,00
3A 376 DATA 3E,46,06,0E,0E,CE,7C
```

```
   ,00,C6,CC,F8,F0,F8,EC,E6,00
69 377 DATA C0,C0,C0,E0,E0,E0,FE
   ,00,C6,EE,FE,F6,E6,E6,E6,00
1E 378 DATA C6,E6,F6,FE,EE,E6,E6
   ,00,7C,C6,C6,E6,E6,E6,7C,00
F7 379 DATA FC,C6,C6,FC,E0,E0,E0
   ,00,7C,C6,C6,E6,E6,7C,0E,00
22 380 DATA FC,C6,C6,FC,F8,EC,E6
   ,00,7C,C6,C0,7C,0E,CE,7C,00
9B 381 DATA 7E,18,18,38,38,38,38
   ,00,C6,C6,C6,E6,E6,E6,7C,00
19 382 DATA C6,C6,C6,E6,E6,7C,38
   ,00,C6,C6,C6,F6,FE,EE,E6,00
1E 383 DATA C6,C6,7C,38,7C,E6,E6
   ,00,C6,C6,C6,7C,38,38,38,00
87 384 DATA FE,06,0C,38,70,E0,FE
   ,00,3C,30,30,30,30,30,3C,00
7D 385 DATA 0C,12,30,7C,30,62,FC
   ,00,3C,0C,0C,0C,0C,0C,3C,00
D7 386 DATA 00,18,3C,7E,18,18,18
   ,18,00,10,30,7F,7F,30,10,00
39 387 DATA 00,00,00,00.00,00,00
   ,00,0C,0C,18,18,00,30,30,00
C8 388 DATA 66,66,66,00,00,00,00
   ,00,66,66,FF,66,FF,EE,EE,00
AA 389 DATA 18,3E,60,3C,06,7C,18
   ,00,62,66,0C,18,30,66,46,00
BD 390 DATA 3C,66,3C,38,67,66,3F
   ,00,06,0C,18,00,00,00,00,00
C7 391 DATA 0C,18,30,30,30,18,0C
   ,00,30,18,0C,0C,0C,18,30,00
9F 392 DATA 00,0C,3B,EA,5A,19,04
   ,00,00,18,18,7E,18,18,00,00
4C 393 DATA 00,00,00,00,00,18,18
   ,30,00,00,00,7E,00,00,00,00
B0 394 DATA 00,00,00,00,00,56,56
   ,00,00,03,06,0C,18,30,60,00
F0 395 DATA 7E,66,6E,76,76,76,7E
   ,00,0C,0C,0C,1C,1C,1C,1C,00
36 396 DATA 7E,06,06,7E,70,70,7E
   ,00,7E,06,06,1E,0E,0E,7E,00
72 397 DATA 66,66,66,7E,0E,0E,0E
   ,00,7E,60,60,7E,0E,0E,7E,00
0D 398 DATA 7E,60,60,7E,76,76,7E
   ,00,7E,06,06,1E,0E,0E,0E,00
99 399 DATA 7E,66,66,7E,76,76,7E
   ,00,7E,66,66,7E,0E,0E,7E,00
03 400 DATA 00,00,18,00,00,18,18
   ,00,00,00,18,00,00,18,18,30
8C 401 DATA 06,18,30,70,30,18,06
   ,00,00,00,7E,00,7E,00,00,00
49 402 DATA 60,18,0C,0E,0C,18,60
   ,00,00,FF,AA,55,AA,FF,AA,55
E7 403 DATA 00,00,FF,AA,AA,55,00
   ,00,00,00,00,00,00,00,00,00
8A 404 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
89 405 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
E1 406 DATA AD,86,02,8D,B1,97,A9
   ,05,8D,86,02,A9,93,20,D2,FF
32 407 DATA A9,30,85,FC,A9,02,85
   ,FD,A9,00,85,90,A9,24,85,FB
F7 408 DATA A9,FB,85,BB,A9,00,85
   ,BC,A5,FD,85,B7,A9,08,85,BA
84 409 DATA A9,60,85,B9,20,D5,F3
   ,A5,BA,20,B4,FF,A5,B9,20,96
FB 410 DATA FF,A4,90,D0,48,A0,06
   ,84,FB,20,E4,FF,C9,20,D0,07
23 411 DATA 20,E4,FF,C9,20,D0,F9
   ,20,A5,FF,A6,FC,85,FC,A4,90
34 412 DATA D0,2E,A4,FB,88,D0,E0
   ,A4,FC,20,CD,BD,A9,20,20,D2
32 413 DATA FF,20,A5,FF,A6,90,D0
   ,18,AA,F0,06,20,D2,FF,4C,41
1B 414 DATA 97,A9,0D,20,D2,FF,A5
   ,C5,C9,3F,F0,04,A0,04,D0,B7
98 415 DATA 20,42,F6,A9,02,8D,86
   ,02,A9,0D,20,D2,FF,A9,00,85
79 416 DATA 90,A9,08,85,BA,20,B4
   ,FF,A9,6F,85,B9,20,96,FF,A4
72 417 DATA 90,D0,0A,20,A5,FF,20
   ,D2,FF,C9,00,D0,F2,20,AB,FF
3E 418 DATA A9,06,8D,86,02,A2,00
   ,BD,B2,97,C9,FF,F0,07,20,D2
1A 419 DATA FF,E8,4C,97,97,20,E4
   ,FF,F0,FB,AD,B1,97,8D,86,02
3D 420 DATA 60,02,0D,12,20,48,49
   ,54,20,41,20,4B,45,59,20,46
C6 421 DATA 4F,52,20,46,58,2D,45
   ,44,49,54,4F,52,20,92,FF,00
98 422 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
9F 423 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
9E 424 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
AE 425 DATA 00,00,00,00,0F,0F,0F
   ,0F,39,39,3B,3A,3A,35,00,00
78 426 DATA 00,00,FF,A9,A9,55,39
   ,39,00,00,00,00,00,00,00,00
F0 427 DATA 00,00,3F,3A,3A,39,39
   ,39,00,00,00,00,00,00,00,00
22 428 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
21 429 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
20 430 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
A7 431 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,00
46 432 DATA 00,00,00,00,00,00,00
   ,00,00,00,00,00,F0,F0,F0,F0
E0 433 DATA 0F,0F,0F,0F,00,00,00
   ,00,39,39,F9,A9,A9,55,00,00
AC 434 DATA F0,F0,F0,F0,00,00,00
   ,00,00,00,00,00,00,00,00,00
1D 435 DATA C3,99,91,91,8F,8D,C3
   ,FF,83,39,39,01,19,19,19,FF
36 436 DATA 03,39,39,03,19,19,03
   ,FF,83,39,3F,1F,1F,19,83,FF
18 437 DATA 03,39,39,19,19,19,03
   ,FF,01,3F,3F,07,1F,1F,01,FF
5A 438 DATA 01,3F,3F,07,1F,1F,1F
   ,FF,83,39,3F,11,19,19,83,FF
60 439 DATA 39,39,39,01,19,19,19
   ,FF,E7,E7,E7,C7,C7,C7,C3,FF
41 440 DATA 81,39,F9,F1,F1,31,83
   ,FF,39,33,07,0F,07,13,19,FF
34 441 DATA 3F,3F,3F,1F,1F,1F,01
   ,FF,39,11,01,09,19,19,19,FF
E8 442 DATA 39,19,09,01,11,19,19
   ,FF,83,39,39,19,19,19,83,FF
07 443 DATA 03,39,39,03,1F,1F,1F
   ,FF,83,39,39,19,19,83,F1,FF
68 444 DATA 03,39,39,03,07,13,19
   ,FF,83,39,3F,83,F1,31,83,FF
BF 445 DATA 81,E7,E7,C7,C7,C7,C7
   ,FF,39,39,39,19,19,19,83,FF
79 446 DATA 39,39,39,19,19,83,C7
   ,FF,39,39,39,09,01,11,19,FF
7A 447 DATA 39,39,83,C7,83,19,19
   ,FF,39,39,39,83,C7,C7,C7,FF
6C 448 DATA 01,F9,F3,C7,8F,1F,01
   ,FF,C3,CF,CF,CF,CF,CF,C3,FF
BF 449 DATA F3,ED,CF,83,CF,9D,03
   ,FF,C3,F3,F3,F3,F3,F3,C3,FF
A5 450 DATA FF,E7,C3,81,E7,E7,E7
   ,E7,FF,EF,CF,80,80,CF,EF,FF
89 451 DATA FF,FF,FF,FF,FF,FF,FF
   ,FF,F3,F3,E7,E7,FF,CF,CF,FF
2A 452 DATA 99,99,99,FF,FF,FF,FF
   ,FF,99,99,00,99,00,11,11,FF
54 453 DATA E7,C1,9F,C3,F9,83,E7
   ,FF,9D,99,F3,E7,CF,99,B9,FF
8A 454 DATA C3,99,C3,C7,98,99,C0
   ,FF,F9,F3,E7,FF,FF,FF,FF,FF
49 455 DATA F3,E7,CF,CF,CF,E7,F3
   ,FF,CF,E7,F3,F3,F3,E7,CF,FF
D7 456 DATA FF,99,C3,00,C3,99,FF
   ,FF,FF,E7,E7,81,E7,E7,FF,FF
81 457 DATA FF,FF,FF,FF,FF,E7,E7
   ,CF,FF,FF,FF,81,FF,FF,FF,FF
35 458 DATA FF,FF,FF,FF,FF,99,99
   ,FF,FF,FC,F9,F3,E7,CF,9F,FF
23 459 DATA 81,99,91,89,89,89,91
   ,FF,F3,F3,F3,E3,E3,E3,E3,FF
C3 460 DATA 81,F9,F9,81,8F,8F,81
   ,FF,81,F9,F9,E1,F1,F1,81,FF
FE 461 DATA 99,99,99,81,F1,F1,F1
   ,FF,81,9F,9F,81,F1,F1,81,FF
E1 462 DATA 81,9F,9F,81,89,89,81
   ,FF,81,F9,F9,E1,F1,F1,F1,FF
69 463 DATA 81,99,99,81,89,89,81
   ,FF,81,99,99,81,F1,F1,81,FF
2F 464 DATA FF,FF,E7,FF,FF,E7,E7
   ,FF,FF,FF,E7,FF,FF,E7,E7,CF
CB 465 DATA F9,E7,CF,8F,CF,E7,F9
   ,FF,FF,FF,81,FF,81,FF,FF,FF
6B 466 DATA 9F,E7,F3,F1,F3,E7,9F
   ,FF,C3,99,F9,F3,E7,FF,E7,FF
D5 467 DATA 00,00,00,00,00,00,01
   ,01,00,00,7F,7F,00,00,F8,F8
74 468 DATA 00,00,F0,F8,00,00,0C
   ,18,03,03,07,07,0F,0F,1F,1F
B2 469 DATA F0,F0,E0,E0,C0,C0,81
   ,FF,18,30,31,61,63,C3,87,07
B8 470 DATA FC,00,F8,F8,F1,F1,E3
   ,E3,7F,00,FC,FC,F9,F8,F1,FF
10 471 DATA F1,00,03,03,E7,C7,8F
   ,8F,F8,00,F0,F0,E0,E0,C0,C0
11 472 DATA FF,00,1F,1F,3F,3F,7E
   ,7E,FC,00,80,80,01,01,03,03
11 473 DATA 7F,00,FC,FC,FF,F8,F0
   ,F0,F8,00,31,31,E3,63,C7,C7
04 474 DATA FC,00,F8,F8,F0,F0,E0
   ,FF,FF,00,F8,FE,F0,F0,E0,FF
72 475 DATA E6,00,06,03,03,03,01
   ,01,1F,00,3F,3F,7E,7E,FC,FC
0E 476 DATA 87,00,0F,0F,1F,1F,3F
   ,3F,FF,00,C0,F0,80,80,01,F9
C8 477 DATA 3F,00,7E,7E,FC,FC,F8
   ,FF,01,00,03,03,07,07,0F,CF
AE 478 DATA FF,00,F0,F0,E1,E1,C2
   ,FE,C7,00,8F,8F,1F,1F,3F,3F
BA 479 DATA FF,00,C2,C2,84,FC,00
   ,00,0F,00,1F,1F,3F,3F,7E,7E
0E 480 DATA C1,00,87,9C,01,01,03
   ,03,F1,00,E3,C3,87,87,0F,0F
46 481 DATA FF,00,F0,FC,E0,E0,C0
   ,FE,C7,00,0F,0F,1F,1F,3F,3F
7C 482 DATA E0,00,F1,F1,9B,9B,0E
   ,0E,DF,00,C3,83,07,07,0F,0F
6E 483 DATA FF,00,F0,F0,E0,E0,C0
   ,C0,BF,00,1F,1F,00,00,00,7F
72 484 DATA FF,00,80,FF,3F,3F,7E
   ,FE,E0,00,00,80,00,00,00,00
D4 485 DATA 00,00,00,00,00,00,00
   ,01,00,00,00,00,00,00,80,40
FF 486 DATA 00,00,00,00,00,00,00
   ,01,05,1A,20,C0,00,00,00,00
69 487 DATA 40,20,20,22,25,15,09
   ,01,09,15,22,20,20,40,40,40
F3 488 DATA 80,00,00,00,00,00,00
   ,00,00,00,00,00,80,80,43,42
1C 489 DATA 00,00,00,82,62,32,1A
   ,AF,00,00,00,00,08,10,20,40
68 490 DATA 34,08,00,00,00,00,00
   ,00,57,0F,0F,17,27,42,82,02
B1 491 DATA 90,28,A9,4A,8A,CA,64
   ,30,02,00,00,00,00,00,00,00
DA 492 DATA 10,08,00,00,00,00,00
   ,00,00,00,00,00,00,00,00,01
08 493 DATA 00,00,00,00,00,00,80
   ,40,02,82,64,18,00,00,00,00
CA 494 DATA 20,10,0C,02,01,00,00
   ,00,00,00,20,50,89,05,02,00
0F 495 DATA 00,00,00,C6,39,06,00
   ,00,93,1D,1D,1D,97,B0,C0,C0
E6 496 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,C0,C0,C0,C0
69 497 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,C0,C0,AE,0D
F0 498 DATA 1D,1D,1D,DD,20,9C,46
   ,58,2D,45,44,49,54,4F,52,20
23 499 DATA 51,55,49,43,4B,20,52
   ,45,46,45,52,45,4E,43,45,20
44 500 DATA 43,41,52,44,20,97,DD
   ,0D,1D,1D,1D,97,AD,C0,C0,C0
69 501 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,C0,C0,C0,C0
C7 502 DATA C0,C0,C0,C0,C0,C0,C0
   ,C0,C0,C0,C0,C0,C0,BD,0D,20
B0 503 DATA 97,B0,C0,C0,C0,C0,AE
   ,1D,1D,1D,1D,1D,1D,1D,1D,1D
1F 504 DATA 1D,1D,1D,1D,1D,B0,C0
   ,C0,C0,C0,AE,0D,20,DD,1C,20
FC 505 DATA 46,31,20,97,DD,20,1E
   ,43,4F,50,59,20,46,58,2E,2E
55 506 DATA 2E,2E,1D,1D,97,DD,20
   ,1C,46,32,20,97,DD,20,1E,44
```

```
7E   507 DATA 49,52,45,43,54,4F,52
         ,59,2E,2E,0D,20,97,AD,C0,C0
DF   508 DATA C0,C0,BD,1D,1D,1D,1D
         ,1D,1D,1D,1D,1D,1D,1D,1D,1D
BD   509 DATA 1D,AD,C0,C0,C0,C0,BD
         ,0D,20,97,B0,C0,C0,C0,C0,AE
A7   510 DATA 1D,1D,1D,1D,1D,1D,1D
         ,1D,1D,1D,1D,1D,1D,1D,B0,C0
CA   511 DATA C0,C0,C0,AE,0D,20,DD
         ,1C,20,46,33,20,97,DD,20,1E
92   512 DATA 46,58,20,54,4F,20,42
         ,41,4E,4B,2E,1D,1D,97,DD,20
6F   513 DATA 1C,4E,34,20,97,DD,20
         ,1E,4C,4F,41,44,20,44,41,54
25   514 DATA 41,2E,2E,0D,20,97,AD
         ,C0,C0,C0,C0,BD,1D,1D,1D,1D
6F   515 DATA 1D,1D,1D,1D,1D,1D,1D
         ,1D,1D,1D,AD,C0,C0,C0,C0,BD
56   516 DATA 0D,20,97,B0,C0,C0,C0
         ,C0,AE,1D,1D,1D,1D,1D,1D,1D
FF   517 DATA 1D,1D,1D,1D,1D,1D,1D
         ,B0,C0,C0,C0,C0,AE,0D,20,DD
BA   518 DATA 1C,20,46,35,20,97,DD
         ,20,1E,42,41,4E,4B,20,54,4F
45   519 DATA 20,46,58,2E,1D,1D,97
         ,DD,20,1C,46,36,20,97,DD,20
A9   520 DATA 1E,53,41,56,45,20,46
         ,58,27,53,2E,2E,0D,20,97,AD
AF   521 DATA C0,C0,C0,C0,BD,1D,1D
         ,1D,1D,1D,1D,1D,1D,1D,1D,1D
32   522 DATA 1D,1D,1D,AD,C0,C0,C0
         ,C0,BD,0D,20,97,B0,C0,C0,C0
EF   523 DATA C0,AE,1D,1D,1D,1D,1D
         ,1D,1D,1D,1D,1D,1D,1D,1D,1D
1F   524 DATA B0,C0,C0,C0,C0,AE,0D
         ,20,DD,1C,20,46,37,20,97,DD
DC   525 DATA 20,1E,53,41,56,45,20
         ,50,4C,41,59,45,52,1D,1D,97
1D   526 DATA DD,20,1C,46,38,20,97
         ,DD,20,1E,53,41,56,45,20,42
BD   527 DATA 41,4E,4B,2E,2E,0D,20
         ,97,AD,C0,C0,C0,C0,BD,1D,1D
9B   528 DATA 1D,1D,1D,1D,1D,1D,1D
         ,1D,1D,1D,1D,1D,AD,C0,C0,C0
FA   529 DATA C0,BD,0D,11,20,97,B0
         ,C0,C0,C0,C0,C0,AE,20,20,20
4C   530 DATA 20,20,20,20,20,20,20
         ,20,20,20,B0,C0,C0,C0,C0,C0
8B   531 DATA AE,0D,20,DD,20,1C,5A
         ,2F,58,20,97,DD,20,1E,2D,2F
CB   532 DATA 2B,20,42,41,4E,4B,20
         ,20,20,20,97,DD,20,1C,2B,2F
D2   533 DATA 2D,20,97,DD,20,1E,2B
         ,2F,2D,20,45,46,46,45,43,54
A5   534 DATA 0D,20,97,AD,C0,C0,C0
         ,C0,C0,BD,20,20,20,20,20,20
26   535 DATA 20,20,20,20,20,20,20
         ,AD,C0,C0,C0,C0,C0,BD,0D,20
86   536 DATA 97,B0,C0,C0,C0,AE,20
         ,20,20,20,20,20,20,20,20,20
99   537 DATA 20,20,20,20,20,B0,C0
         ,C0,C0,C0,C0,AE,0D,20,DD,20
F5   538 DATA 1C,5F,97,20,DD,20,1E
         ,41,55,54,4F,20,4F,4E,2F,4F
4D   539 DATA 46,46,20,20,20,97,DD
         ,20,1C,52,45,54,20,97,DD,20
BD   540 DATA 1E,50,4C,41,59,20,46
         ,58,27,53,0D,20,97,AD,C0,C0
65   541 DATA C0,BD,20,20,20,20,20
         ,20,20,20,20,20,20,20,20,20
26   542 DATA 20,AD,C0,C0,C0,C0,C0
         ,BD,0D,1D,1D,1D,1D,1D,1D,1D
48   543 DATA 1D,9F,50,52,45,53,53
         ,20,41,4E,59,20,4B,45,59,20
09   544 DATA 54,4F,20,52,45,54,55
         ,52,4E,FF,EA,EA,EA,EA,EA,FF
A3   545 DATA E0,00,80,20,00,80,20
         ,00,80,20,00,80,20,00,80,20
FA   545 DATA 00,80,20,00,80,20,00
         ,80,20,00,80,20,00,FF,E0,00
1A   547 DATA 00,00,00,00,00,00,00
         ,00,00,00,00,00,00,00,00,00
19   548 DATA 00,00,00,00,00,00,00
         ,00,00,00,00,00,00,00,00,00
06   549 DATA 00,00,55,55,55,AA,AA
         ,AA,FF,FF,FF,AA,AA,AA,55,55
0F   550 DATA 55,AA,AA,AA,FF,FF,FF
         ,00,00,00,00,00,00,00,00,00
1E   551 DATA 00,00,00,00,00,00,00
         ,00,00,00,00,00,00,00,00,00
1D   552 DATA 00,00,00,00,00,00,00
         ,00,00,00,00,00,00,00,00,00
```

C16 DISK MONITOR

PROGRAM: CHECK LOADER

```
10 DATA 0600
20 DATA A9,0D,20,D2,FF,20,AD,FA,
A5,F2,F0,03,4C,92,F4,A5,F1,F0,02
,D0,02,A9,0CCD
30 DATA 03,85,AE,A9,00,20,BD,FF,
A9,00,85,AC,85,AD,20,C0,FF,A9,00
,20,C9,FF,0B37
40 DATA B0,4E,20,AD,FA,20,5B,FB,
20,AD,FA,A0,00,A5,A1,85,D3,18,A5
,A2,65,D3,08D7
50 DATA 85,D3,20,96,CF,45,D3,85,
D3,C8,C0,50,F0,0D,18,20,96,CF,65
,D3,85,D3,0C4F
60 DATA C8,C0,50,D0,E7,20,FB,FA,
A5,D3,20,05,FB,18,A5,A1,69,50,90
,02,E6,A2,0C6D
70 DATA 85,A1,A5,A2,C5,F2,90,C1,
F0,02,B0,06,A5,A1,C5,F1,90,B7,20
,3E,90,A9,0CF7
80 DATA 00,20,C3,FF,20,CC,FF,4C,
95,F4,00,00,00,00,00,00,00,00,00
,00,00,00,05A2
90 DATA END
63000 READAD$:AD=DEC(AD$)
63010 DO:CK=0:FORX=0TO21:READM$:
IFM$="END"THENEXIT:ELSEM=DEC(M$)
:POKEAD+X,M:CK=CK+M
63020 NEXTX:READCH$:IFDEC(CH$)<>
CKTHENPRINT"ERROR IN";PEEK(63)+2
56*PEEK(64):GOTO63040
63030 AD=AD+22:LOOP:PRINT"OK....
":END
63040 PRINT"L.";PEEK(63)+256*PEE
K(64)
63050 POKE239,4:POKE1319,145:POK
E1320,145:POKE1321,145:POKE1322,
13:END
```

C16 DISK MONITOR

PROGRAM: MONITOR M/C

```
01000 FA 0B 10 0A 00 9E 34 31 31 32 00 00 00 00 00 00
01010 4C 24 1D A9 00 2C A9 01 2C A9 02 2C A9 03 2C A9
01020 04 2C A9 05 8D 71 1C 20 5F 14 A9 00 8D BA 17 A9
01030 01 8D B9 17 20 27 13 20 CB 12 20 EA 12 20 C5 16
01040 A9 00 8D B9 17 20 99 13 4C 74 16 20 27 13 20 EA
01050 12 A2 0D 20 C6 FF A0 00 20 CF FF 99 00 3F C8 D0
01060 F7 20 99 13 4C 74 16 AD 00 3F F0 0C 8D DA 12 AD
01070 01 3F 8D D9 12 20 4B 10 4C 49 11 20 27 13 20 EA
01080 12 A2 0D 20 C9 FF A0 00 B9 00 3F 20 D2 FF C8 D0
01090 F7 20 99 13 20 22 13 4C 74 16 20 5B FB A0 00 20
010A0 FB 23 B0 09 A5 F1 91 A1 C8 C0 08 90 F2 20 4F FF
010B0 1B 4F 91 00 20 3A FB A9 3E 20 D2 FF A5 A1 20 05
010C0 FB 20 A5 F5 A9 08 4C 96 FB 20 5B FB 20 FB 23 90
010D0 13 A5 A1 C9 F9 90 04 A9 F8 85 A1 85 F1 A5 A2 85
010E0 F2 4C F4 10 A0 3F 84 F2 A5 F1 C5 A1 90 E3 A5 A1
010F0 C9 F9 B0 DD 20 64 FB 4A 66 F1 4A 66 F1 4A 66 F1
01100 A9 00 85 F2 20 E1 FF F0 1A 20 3A FB A9 3E 20 D2
01110 FF A5 A1 20 05 FB 20 A5 F5 A9 08 20 96 FB 20 72
01120 FB B0 E1 60 2B 5B 3E 4D 52 57 9A 10 C9 10 4B 10
01130 7B 10 00 00 20 CF 11 AD 33 11 8D DA 12 AD 32 11
01140 8D D9 12 4C 49 11 20 0B FB 20 6F 12 20 3A FB A2
01150 00 86 F3 20 CF FF 9D 00 02 E8 C9 0D D0 F5 CA 86
01160 F4 20 3F FB F0 E3 C9 20 F0 F7 C9 50 F0 0C A2 05
01170 DD 24 11 F0 08 CA 10 F8 30 CC 4C E6 35 E0 00 F0
01180 07 E0 00 D0 12 4C 67 10 AD 00 12 8D 33 11 AD D9
01190 12 8D 32 11 00 D9 1D CA CA 8A 0A A8 B9 2B 11 00
011A0 56 B9 2A 11 85 55 E0 02 B0 0D 00 FB 23 A0 3F 84
011B0 F2 20 54 00 4C 00 11 20 FB 23 A5 F1 F0 88 8D DA
011C0 00 20 FB 23 A5 F1 8D D9 12 20 54 00 4C 49 11 20
011D0 88 D8 20 4F FF 43 55 52 52 45 4E 54 20 54 52 41
011E0 43 4B 20 26 20 53 45 43 54 D1 00 20 31 32 20 30
011F0 30 0D 4E 45 58 54 20 54 52 41 43 4B 20 26 20 53
01200 45 43 54 00 52 20 20 20 20 31 32 20 30 31 0D 55
01210 4E 49 54 20 30 38 20 20 44 52 49 56 45 20 30 30
01220 0D 1C 10 C0 FF C0 FF C0 FF 20 01 04 C0 C0 C0 00
01230 41 41 41 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 09
01240 C0 00 05 94 09 09 09 89 09 00 C0 F0 50 40 21 00
01250 90 41 00 41 21 11 81 11 21 41 41 41 11 46 05 60
01260 AD EB 07 C9 13 D0 05 06 00 00 00 00 00 02 08 02
01270 00 12 20 20 0F 0F 3F 8D FF 0C 8A 29 3F 8D 18 0C
01280 AD D9 12 20 20 FF FF FF 8D 1A 0C 8A 29 3F 8D 1B
01290 0C AD 00 3F 20 20 FB 29 3F 8D 3F 0C 8A 29 3F 8D
012A0 40 0C AD 01 3F 20 20 FB 29 3F 8D 42 0C 8A 29 3F
012B0 8D 43 0C AD DC 12 20 20 FB 29 3E 8D 55 0C 8A 8D
012C0 56 0C 29 3F AD DB 12 8D 60 0C 60 A9 01 2C A9 00
012D0 8D D9 12 A9 12 8D DA 12 60 00 00 30 08 55 31 3A
012E0 31 33 20 30 20 30 30 20 30 30 A9 31 8D DE 12 A2
012F0 0F 20 C9 FF AD DA 12 20 77 13 8E E5 12 00 E6 12
01300 AD D9 12 20 77 13 8E E8 12 8D E9 12 AD DB 12 8D
01310 E3 12 A2 00 BD DD 12 20 D2 FF E8 E0 0D D0 F5 4C
```

```
>01320 99 13 A9 32 4C EC 12 20 42 13 A9 0D A8 AE DC 12:
>01330 20 BA FF A9 01 A0 13 A2 74 20 BD FF 20 C0 FF 4C:
>01340 99 13 AD DB 12 8D 76 13 A9 0F A8 AE DC 12 20 BA:
>01350 FF A9 02 A0 13 A2 75 20 BD FF 20 C0 FF 4C 99 13:
>01360 A9 0F A8 AE DC 12 20 BA FF A9 00 20 BD FF 20 C0:
>01370 FF 4C 99 13 23 49 30 A0 30 C9 64 B0 0D A2 30 38:
>01380 E9 0A 90 03 E8 B0 F9 69 3A 60 E9 64 90 03 C8 B0:
>01390 F9 69 64 4C 7D 13 4C CC FF A9 0A A0 14 85 7A 84:
>013A0 7B 20 CC FF A2 0F 20 C6 FF B0 2B 20 04 CD AD 0A:
>013B0 14 C9 32 90 E1 20 74 16 20 E7 FF A0 14 A9 09 20:
>013C0 88 90 20 3A FB 20 D8 BA A9 00 8D B9 17 8D BA 17:
>013D0 20 90 16 4C D9 1D AA CA BA 48 20 CC FF 20 74 16:
>013E0 20 E7 FF 68 20 53 86 20 3A FB 20 0B FB A0 00 B1:
>013F0 24 48 29 7F 20 D2 FF C8 68 10 F4 20 4F FF 20 45:
>01400 52 52 4F 52 20 00 4C C2 13 0D 20 20 20 20 20 20:
>01410 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20:
>01420 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20:
>01430 20 20 00 42 2D 50 3A 31 33 20 30 30 30 20 77 13:
>01440 8C 3A 14 8E 3B 14 8D 3C 14 A2 0F 20 C9 FF A2 00:
>01450 BD 33 14 20 D2 FF E8 E0 0A D0 F5 20 CC FF 60 20:
>01460 4F FF 93 41 20 54 4F 20 41 42 4F 52 54 20 20 20:
>01470 20 20 20 20 20 20 20 20 20 20 44 20 46 4F 52 20:
>01480 41 20 44 49 52 45 43 54 4F 52 59 0D 20 20 20 20:
>01490 20 20 20 41 4E 59 20 4B 45 59 20 54 4F 20 43 4F:
>014A0 4E 54 49 4E 55 45 00 A9 00 8D 12 15 20 E4 FF D0:
>014B0 FB 20 E4 FF F0 FB C9 41 D0 03 68 68 60 C9 44 D0:
>014C0 06 20 AF 15 4C 5F 14 20 4F FF 0D 0D 45 4E 54 45:
>014D0 52 20 46 49 4C 45 4E 41 4D 45 0D 0D 00 A2 00 20:
>014E0 CF FF C9 0D F0 08 9D 14 15 E8 E0 10 D0 F1 8E 13:
>014F0 15 CA BD 14 15 C9 2A D0 06 EE 12 15 4C 0E 15 E0:
>01500 0F F0 09 E8 A9 A0 9D 14 15 4C FF 14 A2 10 8E 13:
>01510 15 60 00 00 20 20 20 20 20 20 20 20 20 20 20 20:
>01520 20 20 20 20 20 CC FF 20 74 16 A2 9D A0 15 A9 04:
>01530 20 BD FF A9 00 A8 AE DC 12 20 BA FF 20 C0 FF A2:
>01540 00 20 C6 FF A5 90 D0 4A 20 CF FF C9 01 D0 F9 20:
>01550 CF FF 20 CF FF 8D AE 15 20 CF FF 8D AD 15 A2 00:
>01560 20 CF FF 9D 00 02 C9 00 F0 03 E8 D0 F3 A2 00 BD:
>01570 00 02 DD A1 15 D0 CD E8 E0 0C D0 F3 20 3A FB AE:
>01580 AD 15 AD AE 15 20 FF FA 20 08 FB A0 02 A9 00 20:
>01590 88 90 20 CC FF A9 00 20 C3 FF 4C 3A FB 24 30 3A:
>015A0 40 42 4C 4F 43 4B 53 20 46 52 45 45 2E 00 00 20:
>015B0 CE 12 20 27 13 20 EA 12 A9 90 20 3D 14 A2 0D 20:
>015C0 C6 FF A0 00 20 CF FF 99 E1 15 C8 C0 14 D0 F5 20:
>015D0 CB 12 20 4F FF 93 20 20 20 20 20 20 20 20 20 20:
>015E0 12 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20:
>015F0 20 20 20 20 20 92 0D 0D 54 52 20 53 45 20 4C 45:
>01600 20 20 20 54 49 54 4C 45 20 20 20 20 20 20 20 20:
>01610 20 20 20 20 20 20 54 59 50 45 20 20 53 41 0D C0:
>01620 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>01630 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>01640 C0 C0 C0 C0 C0 C0 C0 0D 00 20 EA 12 EE BA 17 20:
>01650 C5 16 AD DA 12 F0 11 20 EA 12 20 C5 16 AD DA 12:
>01660 F0 06 20 90 16 4C D2 15 20 24 15 CE BA 17 20 90:
>01670 16 4C 74 16 A9 0D 20 C3 FF A9 02 20 C3 FF A9 03:
>01680 20 C3 FF A9 00 20 C3 FF A9 0F 20 C3 FF 4C E7 FF:
>01690 20 4F FF 20 20 20 20 20 20 20 12 50 52 45 53 53:
>016A0 20 41 4E 59 20 4B 45 59 20 54 4F 20 43 4F 4E 54:
>016B0 49 4E 55 45 2E 92 00 20 E4 FF D0 FB 20 E4 FF F0:
>016C0 FB 20 3A FB 60 A9 00 8D B8 17 A2 0D 20 C6 FF 20:
>016D0 CF FF 8D DA 12 20 CF FF 8D D9 12 A9 02 8D BB 17:
>016E0 A2 0D 20 C6 FF AD BB 17 8D B0 1B 20 CF FF 8D CD:
>016F0 17 20 CF FF 8D CF 17 20 CF FF 8D CE 17 A2 00 20:
>01700 CF FF 9D BD 17 E8 E0 10 D0 F5 20 CF FF A2 00 20:
>01710 CF FF 8D 35 18 20 B0 17 20 CF FF 8D 36 18 20 B0:
>01720 17 E8 E0 05 D0 E9 20 CF FF 20 B0 17 20 CF FF 20:
>01730 B0 17 AD BB 17 18 69 20 8D BB 17 AD CD 17 D0 13:
>01740 A2 00 BD BD 17 D0 0C E8 E0 10 D0 F6 AD B8 17 D0:
>01750 2E F0 8D AD B9 17 F0 03 20 D0 17 AD BA 17 F0 06:
>01760 20 F4 17 4C 6B 17 AD BC 17 D0 25 AD B8 17 D0 0F:
>01770 AD B9 17 D0 23 AD BB 17 C9 02 F0 14 4C E0 16 20:
>01780 CC FF AD D0 19 F0 03 20 D2 1C A9 00 8D D0 19 60:
>01790 AD 12 15 D0 03 4C 7F 17 AD BB 17 C9 02 D0 0E 20:
>017A0 CC FF AD DA 12 F0 D8 20 EA 12 4C C5 16 4C E0 16:
>017B0 A5 90 F0 03 8D B8 17 60 00 00 00 00 00 20 20 20:
>017C0 20 20 20 20 20 20 20 20 20 20 20 20 20 00 00 00:
>017D0 A0 00 CC 13 15 F0 10 B9 14 15 C9 3F F0 05 D9 BD:
>017E0 17 D0 0B C8 4C D2 17 EE BC 17 20 04 19 60 A9 00:
>017F0 8D BC 17 60 AD CF 17 20 05 FB AD CE 17 20 05 FB:
>01800 AD 35 18 AE 36 18 20 FF FA A9 22 20 D2 FF A2 00:
>01810 BD BD 17 20 D2 FF E8 E0 10 D0 F5 A9 22 20 D2 FF:
>01820 20 08 FB 20 37 18 AD CD 17 29 40 F0 05 A9 3C 20:
>01830 D2 FF 4C 3A FB 00 00 AD CD 17 29 07 48 0A AA BD:
>01840 DC 18 8C DD 18 20 88 90 68 C9 02 F0 0B A0 04 20:
>01850 08 FB 88 D0 FA 4C 5F 18 20 CC FF 20 76 18 AD 75:
>01860 18 20 10 FB AD 74 18 20 10 FB A9 02 20 C3 FF A2:
>01870 0D 4C C6 FF 00 00 AD DB 12 8D C6 18 A0 02 A2 00:
>01880 BD BD 17 99 C6 18 E8 C8 E0 10 D0 F4 A2 00 BD D8:
>01890 18 99 C6 18 E8 C8 E0 04 D0 F4 98 A2 C6 A0 18 20:
>018A0 BD FF A9 02 A8 AE DC 12 20 BA FF 20 C0 FF 20 99:
>018B0 13 A2 02 20 C6 FF 20 CF FF 8D 74 18 20 CF FF 8D:
>018C0 75 18 4C 99 13 4E 30 3A 20 20 20 20 20 20 20 20:
>018D0 20 20 20 20 20 20 20 20 2C 50 2C 52 E6 18 EC 18:
>018E0 F2 18 F8 18 FE 18 44 45 4C 20 20 00 53 45 51 20:
>018F0 20 00 50 52 47 20 20 00 55 53 45 52 20 00 52 45:
>01900 4C 20 20 00 AD 71 1C C9 04 D0 03 4C D1 19 AD CD:
>01910 17 D0 19 AD 71 1C D0 4A 20 CC FF 20 F4 1B 20 72:
>01920 1C AD CD 17 09 80 8D CF 19 4C 7B 19 29 40 F0 19:
>01930 AD 71 1C F0 2D C9 03 F0 29 C9 01 F0 25 C9 02 D0:
>01940 08 AD CD 17 29 BF 4C 72 19 AD 71 1C F0 14 C9 02:
>01950 F0 10 C9 05 F0 12 C9 01 F0 09 AD CD 17 09 40 4C:
>01960 72 19 60 A9 00 4C 72 19 AD CD 17 29 02 F0 F3 4C:
>01970 6B 1A 8D CF 19 20 F4 1B A9 31 8D DE 12 A2 0F 20:
>01980 C9 FF 20 12 13 AD B0 1B 20 3D 14 A2 3D 20 C9 FF:
>01990 AD CF 19 20 D2 FF 20 99 13 A9 32 8D DE 12 A2 0F:
>019A0 20 C9 FF 20 12 13 AD 71 1C C9 02 B0 05 A9 01 8D:
>019B0 D0 19 A9 02 20 C3 FF A9 31 8D DE 12 A2 0F 20 C9:
>019C0 FF 20 0C 13 AD BB 17 20 3D 14 A9 0D 4C C6 FF 00:
>019D0 00 20 F4 1B 20 6B C5 AD E5 12 48 AD E6 12 48 AD:
>019E0 EB 12 48 AD E9 12 48 AD DA 12 48 AD D9 12 48 AD:
>019F0 CF 17 8D DA 12 AD CE 17 8D D9 12 20 3A FB A0 00:
>01A00 8C 3D 05 20 F1 1C 20 EA 12 A2 0D 20 C6 FF 20 CF:
>01A10 FF 8D DA 12 20 CF FF 8D D9 12 20 CC FF AD DA 12:
>01A20 C9 00 F0 16 EE 3D 05 AC 3D 05 C0 10 D0 D5 20 3A:
>01A30 FB 20 90 16 20 6B C5 4C FE 19 20 90 16 68 8D D9:
>01A40 12 68 8D DA 12 68 8D E9 12 68 8D E8 12 68 8D E6:
>01A50 12 68 8D E5 12 A9 31 8D DE 12 AD DB 12 8D E3 12:
>01A60 A2 0F 20 C9 FF 20 12 13 4C B2 19 20 76 18 20 B1:
>01A70 1B 20 CC FF 20 4F FF 0D 43 55 52 52 45 4E 54 20:
>01A80 4C 4F 41 44 2D 41 44 44 52 45 53 53 20 49 53 20:
>01A90 24 00 AE 75 18 AD 74 18 20 FF FA 20 4F FF 0D 44:
>01AA0 4F 20 59 4F 55 20 57 41 4E 54 20 54 4F 20 43 48:
>01AB0 41 4E 47 45 20 54 48 49 53 20 4C 4F 41 44 2D 41:
>01AC0 44 44 52 20 00 20 E4 FF C9 59 F0 0D C9 4E D0 F5:
>01AD0 20 D2 FF 20 3A FB 4C B2 19 20 D2 FF 20 4F FF 0D:
>01AE0 45 4E 54 45 52 20 4E 45 57 20 4C 4F 41 44 2D 41:
>01AF0 44 44 52 45 53 53 20 28 48 45 58 29 20 3F 20 00:
>01B00 A2 00 20 CF FF C9 0D F0 08 9D 00 02 E8 E0 04 D0:
>01B10 F1 86 F4 A2 00 86 F3 20 12 24 AD 59 24 D0 8D 20:
>01B20 4F FF 0D 4F 4B 20 54 4F 20 57 52 49 54 45 20 4E:
>01B30 45 57 20 4C 4F 41 44 2D 41 44 44 52 20 3F 20 00:
>01B40 20 E4 FF C9 59 F0 0A C9 4E D0 F5 20 D2 FF 4C 74:
>01B50 1A 20 D2 FF AD DA 12 48 AD D9 12 48 AD E5 12 48:
>01B60 AD E6 12 48 AD EB 12 48 AD E9 12 48 AD CF 17 8D:
>01B70 DA 12 AD CE 17 8D D9 12 20 EA 12 A9 02 20 3D 14:
>01B80 A2 0D 20 C9 FF A5 F1 20 D2 FF A5 F2 20 D2 FF 20:
>01B90 CC FF 20 22 13 68 8D E9 12 68 8D E8 12 68 8D E6:
>01BA0 12 68 8D E5 12 68 8D D9 12 68 8D DA 12 4C B2 19:
>01BB0 00 20 4F FF 0D 46 4F 55 4E 44 20 22 00 A2 00 BD:
>01BC0 BD 17 20 D2 FF E8 E0 10 D0 F5 20 4F FF 22 0D 41:
>01BD0 54 20 54 52 41 43 4B 20 00 AD CF 17 20 05 FB 20:
>01BE0 4F FF 53 45 43 54 4F 52 20 00 AD CE 17 20 05 FB:
>01BF0 20 3A FB 60 20 B1 1B 20 4F FF 44 4F 20 59 4F 55:
>01C00 20 57 41 4E 54 20 54 4F 20 00 20 35 1C 20 4F FF:
>01C10 20 54 48 49 53 20 46 49 4C 45 20 00 20 CC FF 20:
>01C20 E4 FF C9 59 F0 0C C9 4E D0 F5 20 D2 FF 68 68 4C:
>01C30 B2 19 4C D2 FF AD 71 1C 0A AA BD 43 1C BC 44 1C:
>01C40 4C 88 90 4D 1C 57 1C 5F 1C 66 1C 6B 1C 55 4E 53:
>01C50 43 52 41 54 43 48 00 53 43 52 41 54 43 48 00 55:
>01C60 4E 4C 4F 43 4B 00 4C 4F 43 4B 00 54 52 41 43 45:
>01C70 00 00 20 4F FF 0D 31 3D 53 45 51 55 45 4E 54 49:
>01C80 41 4C 0D 32 3D 50 52 4F 47 52 41 4D 0D 33 3D 55:
>01C90 53 45 52 0D 34 3D 52 45 4C 41 54 49 56 45 0D 45:
>01CA0 4E 54 45 52 20 46 49 4C 45 2D 54 59 50 45 20 28:
>01CB0 31 2D 34 29 20 3F 20 00 20 E4 FF C9 31 90 F9 C9:
>01CC0 35 B0 F5 48 20 D2 FF 20 3A FB 68 38 E9 30 8D CD:
>01CD0 17 60 20 CC FF A2 0F 20 C9 FF AD DB 12 8D F0 1C:
>01CE0 AD EF 1C 20 D2 FF AD F0 1C 20 D2 FF 4C 99 13 56:
>01CF0 30 20 CC FF 20 4F FF 20 20 20 20 20 20 20 20 20:
>01D00 20 54 52 41 43 4B 20 00 AD DA 12 20 05 FB 20 4F:
>01D10 FF 20 20 53 45 43 54 4F 52 20 00 AD D9 12 20 10:
>01D20 FB 4C 3A FB 20 84 FF 20 81 FF 20 CE F2 A9 00 8D:
>01D30 15 FF 8D 19 FF 20 55 12 A9 FF 8D 0C FF 8D 0D FF:
>01D40 A9 80 8D F9 07 20 88 D8 20 4F FF 05 11 11 11 11:
>01D50 11 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 44:
>01D60 49 53 4B 20 4D 4F 4E 49 54 4F 52 0D 20 20 20 20:
>01D70 20 20 20 20 20 20 20 20 20 20 1C C0 C0 C0 C0 C0:
>01D80 C0 C0 C0 C0 C0 C0 C0 05 0D 11 20 20 20 20 46 4F:
>01D90 52 20 54 48 45 20 43 4F 4D 4D 4F 44 4F 52 45 20:
>01DA0 50 4C 55 53 2F 34 20 26 20 43 2D 31 36 0D 1C 20:
>01DB0 20 20 20 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>01DC0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>01DD0 C0 C0 05 0D 0D 00 20 90 16 20 88 D8 20 D8 8A 20:
>01DE0 4F FF 20 20 20 20 20 20 20 20 20 20 20 20 20 20:
>01DF0 20 4D 41 49 4E 20 4D 45 4E 55 0D 1C 20 20 20 20:
>01E00 20 20 20 20 20 20 20 20 20 20 20 C0 C0 C0 C0 C0:
>01E10 C0 C0 C0 C0 05 0D 20 20 20 20 20 20 20 20 20 20:
>01E20 20 20 20 20 20 31 2E 44 49 53 4B 0D 20 20 20 20:
```

```
>01E30 20 20 20 20 20 20 20 20 20 20 20 32 2E 46 49 4C:
>01E40 45 0D 20 20 20 20 20 20 20 20 20 20 20 20 20 20:
>01E50 20 33 2E 4D 4F 4E 49 54 4F 52 0D 20 20 20 20 20:
>01E60 20 20 20 20 20 20 20 20 20 20 34 2E 44 41 54 41:
>01E70 20 4D 41 4B 45 52 0D 20 20 20 20 20 20 20 20 20:
>01E80 20 20 20 20 20 20 35 2E 50 52 49 4E 54 45 52 20:
>01E90 4F 50 54 49 4F 4E 53 0D 20 20 20 20 20 20 20 20:
>01EA0 20 20 20 20 20 20 20 36 2E 45 58 49 54 0D 11 11:
>01EB0 45 4E 54 45 52 20 43 48 4F 49 43 45 20 28 31 2D:
>01EC0 36 29 20 3F 20 00 20 E4 FF C9 31 90 F9 C9 37 B0:
>01ED0 F5 20 D2 FF 38 E9 31 0A A8 B9 E9 1E 85 55 B9 EA:
>01EE0 1E 85 56 20 54 00 4C D9 1D F5 1E 94 20 34 11 D4:
>01EF0 2D 40 32 A4 F2 20 88 D8 20 4F FF 20 20 20 20 20:
>01F00 20 20 20 20 20 20 20 20 20 20 44 49 53 4B 20 4D:
>01F10 45 4E 55 0D 1C 20 20 20 20 20 20 20 20 20 20 20:
>01F20 20 20 20 20 C0 C0 C0 C0 C0 C0 C0 C0 C0 05 0D 20:
>01F30 20 20 20 20 20 20 20 20 20 20 20 20 20 20 30 2E:
>01F40 44 52 49 56 45 0D 20 20 20 20 20 20 20 20 20 20:
>01F50 20 20 20 20 20 31 2E 55 4E 49 54 0D 20 20 20 20:
>01F60 20 20 20 20 20 20 20 20 20 20 20 32 2E 44 49 52:
>01F70 45 43 54 4F 52 59 0D 20 20 20 20 20 20 20 20 20:
>01F80 20 20 20 20 20 20 33 2E 43 4F 4C 4C 45 43 54 0D:
>01F90 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 34:
>01FA0 2E 49 4E 49 54 49 41 4C 49 53 45 0D 00 20 4F FF:
>01FB0 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 35:
>01FC0 2E 46 4F 52 4D 41 54 20 44 49 53 4B 0D 20 20 20:
>01FD0 20 20 20 20 20 20 20 20 20 20 20 20 36 2E 41 4C:
>01FE0 54 45 52 20 48 45 41 44 45 52 0D 20 20 20 20 20:
>01FF0 20 20 20 20 20 20 20 20 20 20 37 2E 4D 45 4D 4F:
>02000 52 59 0D 20 20 20 20 20 20 20 20 20 20 20 20 20:
>02010 20 20 38 2E 56 49 45 57 20 42 41 4D 0D 20 20 20:
>02020 20 20 20 20 20 20 20 20 20 20 20 20 39 2E 45 58:
>02030 49 54 0D 11 11 45 4E 54 45 52 20 43 48 4F 49 43:
>02040 45 20 28 30 2D 39 29 20 3F 20 00 20 E4 FF C9 30:
>02050 90 F9 C9 3A B0 F5 20 D2 FF 38 E9 30 0A A8 B9 71:
>02060 20 85 55 B9 72 20 85 56 20 54 00 4C F5 1E 8D 59:
>02070 24 9D 22 45 23 AF 15 8B 20 85 20 76 25 5A 24 7D:
>02080 28 62 26 D9 1D 20 42 13 4C 74 16 20 42 13 20 D2:
>02090 1C 4C 74 16 20 88 D8 20 4F FF 20 20 20 20 20 20:
>020A0 20 20 20 20 20 20 20 20 20 46 49 4C 45 20 4D 45:
>020B0 4E 55 0D 1C 20 20 20 20 20 20 20 20 20 20 20 20:
>020C0 20 20 20 C0 C0 C0 C0 C0 C0 C0 C0 C0 05 0D 20 20:
>020D0 20 20 20 20 20 20 20 20 20 20 20 20 20 31 2E 54:
>020E0 52 41 43 45 0D 20 20 20 20 20 20 20 20 20 20 20:
>020F0 20 20 20 20 32 2E 4C 4F 43 4B 0D 20 20 20 20 20:
>02100 20 20 20 20 20 20 20 20 20 20 33 2E 55 4E 4C 4F:
>02110 43 4B 0D 20 20 20 20 20 20 20 20 20 20 20 20 20:
>02120 20 20 34 2E 53 43 52 41 54 43 48 0D 20 20 20 20:
>02130 20 20 20 20 20 20 20 20 20 20 20 35 2E 55 4E 53:
>02140 43 52 41 54 43 48 0D 00 20 4F FF 20 20 20 20 20:
>02150 20 20 20 20 20 20 20 20 20 20 36 2E 41 4C 54 45:
>02160 52 20 53 54 41 52 54 20 41 44 44 52 45 53 53 0D:
>02170 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 37:
>02180 2E 45 58 49 54 0D 11 11 45 4E 54 45 52 20 43 48:
>02190 4F 49 43 45 20 28 31 2D 37 29 20 3F 20 00 20 E4:
>021A0 FF C9 31 90 F9 C9 38 B0 F5 20 D2 FF 38 E9 31 0A:
>021B0 A8 B9 C4 21 85 55 B9 C5 21 85 56 20 D2 21 20 54:
>021C0 00 4C 94 20 1F 10 1C 10 19 10 16 10 13 10 22 10:
>021D0 D9 1D 98 48 20 88 D8 68 A8 4A 48 C0 0A B0 26 20:
>021E0 6F 22 BE 64 22 B9 65 22 A8 8A 20 88 90 20 4F FF:
>021F0 20 41 20 46 49 4C 45 0D 00 68 20 80 22 A9 03 8D:
>02200 E6 07 4C 6B C5 C0 0C D0 03 4C BB 14 68 20 4F FF:
>02210 20 20 41 4C 54 45 52 20 54 48 45 20 53 54 41 52:
>02220 54 20 41 44 44 52 45 53 53 20 4F 46 20 41 20 50:
>02230 52 4F 47 52 41 4D 0D 1C 20 20 C0 C0 C0 C0 C0 C0:
>02240 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>02250 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 05 0D:
>02260 00 4C FD 21 6B 1C 66 1C 5F 1C 57 1C 4D 1C 00 AA:
>02270 BD 7B 22 AA 20 08 FB CA D0 FA 60 0E 0E 0D 0D 0B:
>02280 48 20 6F 22 68 AA BD 98 22 AA 20 4F FF 1C C0 05:
>02290 00 CA D0 F6 20 3A FB 60 0C 0B 0D 0E 11 20 4F FF:
>022A0 93 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 41 4C 54 45:
>022B0 52 20 44 52 49 56 45 20 4E 55 4D 42 45 52 0D 1D:
>022C0 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1C C0 C0 C0 C0 C0:
>022D0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 05 0D 0D:
>022E0 43 55 52 52 45 4E 54 20 44 52 49 56 45 20 4E 55:
>022F0 4D 42 45 52 20 49 53 20 2D 20 00 AD DB 12 20 D2:
>02300 FF 20 4F FF 0D 0D 45 4E 54 45 52 20 4E 45 57 20:
>02310 44 52 49 56 45 20 4E 55 4D 42 45 52 20 28 30 20:
>02320 4F 52 20 31 29 20 3F 20 00 20 E4 FF C9 30 90 F9:
>02330 C9 32 B0 F5 20 D2 FF 8D DB 12 A2 00 20 EA E2 E8:
>02340 E0 64 D0 F8 60 20 4F FF 93 1D 1D 1D 1D 1D 1D 1D:
>02350 1D 1D 1D 41 4C 54 45 52 20 55 4E 49 54 20 4E 55:
>02360 4D 42 45 52 0D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1C:
>02370 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>02380 C0 05 0D 0D 43 55 52 52 45 4E 54 20 55 4E 49 54:
>02390 20 4E 55 4D 42 45 52 20 49 53 20 2D 20 00 AD DC:
>023A0 12 20 10 FB 20 4F FF 0D 0D 45 4E 54 45 52 20 4E:
>023B0 45 57 20 55 4E 49 54 20 4E 55 4D 42 45 52 20 28:
>023C0 30 38 2D 30 46 29 20 3F 20 00 A9 03 8D E5 07 A2:
>023D0 00 20 CF FF C9 0D F0 07 9D 00 02 E8 4C D1 23 86:
>023E0 F4 A9 00 85 F3 20 12 24 AD 59 24 D0 07 A5 F1 C9:
>023F0 10 B0 B1 C9 C8 90 AD 8D DC 12 60 20 12 24 08 AD:
>02400 59 24 D0 02 28 60 20 CC FF A9 04 20 C3 FF 28 4C:
>02410 45 11 A9 00 85 F1 85 F2 8D 59 24 20 3F FB F0 34:
>02420 C9 20 F0 F7 C9 20 F0 2B C9 2C F0 27 C9 30 90 25:
>02430 C9 47 B0 21 C9 3A 90 06 C9 41 90 19 E9 08 E9 2F:
>02440 0A 0A 0A 0A A2 04 0A 26 F1 26 F2 CA D0 F8 20 3F:
>02450 FB D0 D1 18 60 EE 59 24 60 00 20 88 D8 20 4F FF:
>02460 20 20 20 20 20 20 20 20 41 4C 54 45 52 20 44 49:
>02470 53 4B 27 53 20 4E 41 4D 45 20 41 4E 44 20 49 44:
>02480 0D 20 20 20 20 20 20 20 20 1C C0 C0 C0 C0 C0 C0:
>02490 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>024A0 C0 C0 05 0D 00 A9 03 8D E5 07 20 CE 12 20 27 13:
>024B0 20 EA 12 A9 90 20 3D 14 A2 0D 20 C6 FF A0 00 20:
>024C0 CF FF 99 E1 15 C8 C0 14 D0 F5 20 CC FF 20 4F FF:
>024D0 43 55 52 52 45 4E 54 20 4E 41 4D 45 20 26 20 49:
>024E0 44 20 3D 20 00 A0 00 B9 E1 15 20 D2 FF C8 C0 14:
>024F0 D0 F5 20 3A FB 20 4F FF 45 4E 54 45 52 20 4E 45:
>02500 57 20 4E 41 4D 45 20 3F 20 00 A0 00 A9 A0 99 E1:
>02510 15 C8 C0 14 D0 FB A0 00 20 CF FF C9 0D F0 08 99:
>02520 E1 15 C8 C0 10 D0 F1 20 3A FB 20 4F FF 45 4E 54:
>02530 45 52 20 4E 45 57 20 49 44 20 4E 55 4D 42 45 52:
>02540 20 3F 20 00 A0 00 20 CF FF C9 0D F0 08 99 F3 15:
>02550 C8 C0 02 D0 F1 A9 90 20 3D 14 A2 0D 20 C9 FF A0:
>02560 00 B9 E1 15 20 D2 FF C8 C0 14 D0 F5 20 CC FF 20:
>02570 22 13 20 74 16 60 20 88 D8 20 4F FF 1D 1D 1D 1D:
>02580 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D 46 4F 52 4D 41 54:
>02590 20 44 49 53 4B 0D 1D 1D 1D 1D 1D 1D 1D 1D 1D 1D:
>025A0 1D 1D 1D 1D 1C C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>025B0 05 0D 00 00 A9 03 8D E6 07 A9 4E 8D C5 18 20 4F:
>025C0 FF 45 4E 54 45 52 20 4E 45 57 20 4E 41 4D 45 20:
>025D0 3F 20 00 A0 00 A9 A0 99 C8 18 C8 C0 14 D0 F8 A0:
>025E0 00 20 CF FF C9 0D F0 08 99 C8 18 C8 C0 10 D0 F1:
>025F0 20 3A FB 20 4F FF 45 4E 54 45 52 20 4E 45 57 20:
>02600 49 44 20 4E 55 4D 42 45 52 20 3F 20 00 A9 00 8D:
>02610 60 26 8D 61 26 A0 00 20 CF FF C9 0D F0 08 99 60:
>02620 26 C8 C0 02 D0 F1 20 60 13 A2 0F 20 C9 FF A0 00:
>02630 B9 C5 18 20 D2 FF C8 C0 13 D0 F5 AD 60 26 F0 12:
>02640 48 A9 2C 20 D2 FF 68 20 D2 FF AD 61 26 F0 03 20:
>02650 D2 FF A9 0D 20 D2 FF 20 3A FB 20 99 13 4C 74 16:
>02660 00 00 20 88 D8 20 4F FF 20 20 20 20 20 20 20 20:
>02670 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20:
>02680 0D 20 20 20 20 20 20 20 56 49 45 57 20 42 41 4D:
>02690 20 1C C0 C0 C0 C0 C0 C0 C0 C0 05 0D 00 A9 03 8D:
>026A0 E6 07 20 27 13 20 CE 12 20 EA 12 20 4F FF 44 49:
>026B0 53 4B 20 4E 41 4D 45 20 3D 20 00 A9 90 20 3D 14:
>026C0 A2 0D 20 C6 FF A0 00 20 CF FF 20 D2 FF C8 C0 10:
>026D0 D0 F5 20 CC FF A9 01 20 3D 14 20 4F FF 0D 0D 0D:
>026E0 00 20 90 16 20 88 D8 20 4F FF 11 11 11 11 11 11:
>026F0 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11:
>02700 20 20 31 32 33 34 35 36 37 38 39 41 42 43 44 45:
>02710 46 30 31 32 33 34 35 36 37 38 39 41 42 43 44 45:
>02720 46 30 31 32 33 13 12 20 20 20 20 20 20 54 52 41:
>02730 43 4B 20 31 2D 33 35 20 20 20 2A 3D 55 53 45 44:
>02740 20 20 20 2E 3D 4E 4F 54 20 20 20 20 20 92 0D 00:
>02750 A0 14 98 20 10 FB 20 3A FB 88 10 F6 A2 0D 20 C6:
>02760 FF 20 CF FF 20 CF FF 20 CF FF A2 01 20 9A 27 E8:
>02770 E0 24 D0 F8 20 99 13 20 74 16 20 4F FF 13 11 11:
>02780 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11:
>02790 11 11 11 11 11 11 00 4C 90 16 20 CF FF 20 CF FF:
>027A0 8D 41 28 20 CF FF 8D 40 28 20 CF FF 8D 3F 28 20:
>027B0 4F FF 13 11 11 11 11 11 11 11 11 11 11 11 11 11:
>027C0 11 11 11 11 11 11 11 11 00 20 66 28 E0 12 F0 72:
>027D0 A0 00 E0 12 90 38 E0 1F 90 0A C0 11 D0 06 20 08:
>027E0 FB 4C 22 28 E0 19 90 0A C0 12 D0 06 20 08 FB 4C:
>027F0 22 28 E0 12 90 0A C0 13 D0 06 20 08 FB 4C 22 28:
>02800 E0 12 90 0A C0 14 D0 06 20 08 FB 4C 22 28 20 2E:
>02810 28 C9 00 D0 08 A9 2A 20 D2 FF 4C 22 28 A9 2E 20:
>02820 D2 FF 20 4F FF 91 9D 00 C8 C0 15 D0 A5 60 4E 3F:
>02830 28 6E 40 28 6E 41 28 90 03 A9 01 60 A9 00 60 00:
>02840 00 00 A0 00 20 2E 28 C9 00 D0 0C 20 4F FF 12 2A:
>02850 92 91 9D 00 4C 60 28 20 4F FF 12 2E 92 91 9D 00:
>02860 C8 C0 13 D0 DF 60 8A 48 20 4F FF 1D 00 E0 00 F0:
>02870 09 A9 1D 20 D2 FF CA 4C 6F 28 68 AA 60 20 88 D8:
>02880 20 4F FF 20 20 20 52 45 41 44 2F 57 52 49 54 45:
>02890 20 44 52 49 56 45 27 53 20 49 4E 54 45 52 4E 41:
>028A0 4C 20 4D 45 4D 4F 52 59 0D 1C 20 20 20 C0 C0 C0:
>028B0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>028C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 05:
>028D0 0D 0D 00 A9 03 8D E6 07 4C DE 28 20 0B FB 20 3A:
>028E0 FB A2 00 86 F3 20 CF FF 9D 00 02 E8 C9 0D D0 F5:
>028F0 CA 86 F4 20 3F FB F0 E6 C9 20 F0 F7 A2 0C DD 29:
```

```
>02900 29 F0 05 CA 10 FB 30 D3 E0 0B 90 03 4C 62 36 8A:
>02910 0A A8 B9 37 29 85 56 B9 36 29 85 55 E0 0A B0 03:
>02920 20 74 2A 20 54 00 4C DE 28 5B 4D 3E 47 54 48 46:
>02930 44 41 2E 50 53 4C 4C 29 52 29 83 29 39 29 0B 2C:
>02940 62 2B 90 2C 83 2A A6 30 A6 30 30 36 20 DB 8A 4C:
>02950 F5 1E B0 08 20 5B FB 20 74 2A 90 06 A9 0B 85 F1:
>02960 D0 0E 20 64 FB 4A 66 F1 4A 66 F1 4A 66 F1 85 F2:
>02970 20 E1 FF F0 0D 20 E5 29 A9 08 20 96 FB 20 72 FB:
>02980 B0 EE 60 B0 14 20 5B FB A0 00 20 74 2A B0 0A A5:
>02990 F1 99 6C 2A C8 C0 08 90 F1 8C 6B 2A 20 41 2A A0:
>029A0 08 8C 6B 2A 20 4F FF 1B 4F 91 00 4C E5 29 A5 A1:
>029B0 8D 3D 2A A5 A2 8D 3E 2A 20 60 13 A2 0F 20 C9 FF:
>029C0 A0 00 B9 3A 2A 20 D2 FF C8 C0 07 D0 F5 20 CC FF:
>029D0 A2 0F 20 C6 FF A0 00 20 CF FF 99 F6 02 C8 C0 08:
>029E0 90 F5 4C 99 13 AD 2F 36 F0 05 A2 04 20 C9 FF 20:
>029F0 3A FB A9 3E 20 D2 FF 20 FB FA 20 CC FF 20 AE 29:
>02A00 AD 2F 36 F0 05 A2 04 20 C9 FF A0 00 B9 F6 02 20:
>02A10 05 FB C8 C0 08 90 F5 20 4F FF 3A 12 00 A0 00 B9:
>02A20 F6 02 29 7F C9 20 B0 02 A9 2E 20 D2 FF C8 C0 08:
>02A30 90 ED 20 CC FF A9 0F 4C C3 FF 4D 2D 52 00 00 08:
>02A40 0D A5 A1 8D 69 2A A5 A2 8D 6A 2A 20 60 13 A2 0F:
>02A50 20 C9 FF A0 00 B9 66 2A 20 D2 FF C8 C0 0F D0 F5:
>02A60 20 99 13 4C 74 16 4D 2D 57 00 00 08 00 00 00 00:
>02A70 00 00 00 00 20 12 24 08 AD 59 24 D0 02 28 60 28:
>02A80 4C DB 28 B0 08 20 5B FB 20 74 2A 90 06 A9 14 85:
>02A90 F1 D0 03 20 64 FB AD 2F 36 F0 03 20 34 2B 20 3A:
>02AA0 FB 20 E1 FF F0 11 20 BA 2A E6 F6 A5 F6 20 96 FB:
>02AB0 A5 F6 20 74 FB B0 DF 4C CC FF A9 2E 20 D2 FF 20:
>02AC0 08 FB 20 FB FA 20 08 FB 20 CC FF 20 AE 29 AD 2F:
>02AD0 36 F0 03 20 34 2B A0 00 B9 F6 02 20 D4 F7 48 A6:
>02AE0 F6 E8 CA 10 0A 20 4F FF 20 20 20 00 4C F5 2A 89:
>02AF0 F6 02 20 05 FB C8 C0 03 90 E8 68 A2 03 20 1B F8:
>02B00 A2 06 E0 03 D0 14 A4 F6 F0 10 AD 4B 05 C9 EB B9:
>02B10 F6 02 B0 1D 20 10 FB 88 D0 F0 0E 4B 05 90 0E BD:
>02B20 8E F8 20 D2 FF BD 94 FB F0 03 20 D2 FF CA D0 D2:
>02B30 60 4C BC F7 A2 04 4C C9 FF B0 24 20 60 13 A2 0F:
>02B40 20 C9 FF 20 4F FF 4D 2D 45 00 A5 F1 20 D2 FF A5:
>02B50 F2 20 D2 FF 20 3A FB 20 99 13 A9 0F 4C C3 FF 4C:
>02B60 DB 28 B0 FB 20 5B FB 20 74 2A B0 F3 20 AA FB A0:
>02B70 00 20 3F FB C9 27 D0 12 20 3F FB 99 5D 02 C8 20:
>02B80 3F FB F0 1D C0 20 D0 F3 F0 17 8C 5C 05 C6 F3 20:
>02B90 74 2A A5 F1 99 5D 02 C8 20 74 2A B0 04 C0 20 D0:
>02BA0 F1 8C 5B 05 20 3A FB 20 60 13 A2 0F 20 C9 FF 20:
>02BB0 4F FF 4D 2D 52 00 A5 A1 20 D2 FF A5 A2 20 D2 FF:
>02BC0 AD 5B 05 20 D2 FF 20 3A FB 20 CC FF A2 0F 20 C6:
>02BD0 FF A2 00 20 CF FF 9D D2 03 E8 EC 5B 05 D0 F4 20:
>02BE0 CC FF A2 00 BD D2 03 DD 5D 02 D0 09 E8 EC 5B 05:
>02BF0 D0 F2 20 FB FA 20 E1 FF F0 08 20 94 FB 20 86 FB:
>02C00 B0 A8 A9 0F 20 C3 FF 60 4C 46 11 B0 FB 20 5B FB:
>02C10 20 74 2A B0 F3 20 AA FB 20 74 2A B0 EB 20 3A FB:
>02C20 20 60 13 A2 0F 20 C9 FF 20 4F FF 4D 2D 52 00 A5:
>02C30 A1 20 D2 FF A5 A2 20 D2 FF A9 01 20 D2 FF 20 3A:
>02C40 FB 20 CC FF A2 0F 20 C6 FF 20 CF FF 48 20 CC FF:
>02C50 A2 0F 20 C9 FF 20 4F FF 4D 2D 57 00 A5 F1 20 D2:
>02C60 FF A5 F2 20 D2 FF A9 01 20 D2 FF 68 20 D2 FF 20:
>02C70 3A FB 20 CC FF E6 F1 D0 02 E6 F2 20 94 FB 20 E1:
>02C80 FF F0 05 20 86 FB B0 9B 20 99 13 A9 0F 4C C3 FF:
>02C90 90 03 4C 46 11 20 5B FB 20 74 2A B0 F5 20 AA FB:
>02CA0 20 74 2A B0 ED 20 60 13 A2 0F 20 C9 FF 20 4F FF:
>02CB0 4D 2D 57 00 A5 A1 20 D2 FF A5 A2 20 D2 FF A9 01:
>02CC0 20 D2 FF A5 F1 20 D2 FF 20 3A FB 20 CC FF 20 94:
>02CD0 FB 20 86 FB 90 D2 20 99 13 A9 0F 4C C3 FF 00 14:
>02CE0 10 18 F6 87 41 44 24 3A 41 44 B2 D1 28 41 44 24:
>02CF0 29 00 50 10 22 F6 EB 3A 43 4B B2 30 3A 81 58 92:
>02D00 30 A4 32 31 3A 87 4D 24 3A 8B 4D 24 B2 22 45 4E:
>02D10 44 22 A7 ED 3A D5 4D B2 D1 28 4D 24 29 3A 97 41:
>02D20 44 AA 58 2C 4D 3A 43 4B B2 43 4B AA 4D 00 BB 10:
>02D30 2C F6 82 58 3A 87 43 48 24 3A 8B D1 28 43 48 24:
>02D40 29 B3 B1 43 4B A7 99 22 45 52 52 4F 52 20 49 4E:
>02D50 22 3B C2 28 36 33 29 AA 32 35 36 AC C2 28 36 34:
>02D60 29 3A 89 36 33 30 34 30 00 A6 10 36 F6 41 44 B2:
>02D70 41 44 AA 32 32 3A EC 3A 99 22 4F 4B 2E 2E 2E 2E:
>02D80 22 3A 80 00 C0 10 40 F6 99 22 4C C9 22 3B C2 28:
>02D90 36 33 29 AA 32 35 36 AC C2 28 36 34 29 00 F4 10:
>02DA0 4A F6 97 32 33 39 2C 34 3A 97 31 33 31 39 2C 31:
>02DB0 34 35 3A 97 31 33 32 30 2C 31 34 35 3A 97 31 33:
>02DC0 32 31 2C 31 34 35 3A 97 31 33 32 32 2C 31 33 3A:
>02DD0 80 00 00 00 20 88 DB 20 4F FF 20 20 20 20 20 20:
>02DE0 20 20 20 20 20 20 20 20 20 44 41 54 41 20 4D 41:
>02DF0 48 45 52 0D 1C 20 20 20 20 20 20 20 20 20 20 20:
>02E00 20 20 20 20 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 05 0D:
>02E10 0D 00 A9 03 8D E6 07 20 4F FF 45 4E 54 45 52 20:
>02E20 46 49 4C 45 4E 41 4D 45 20 4F 46 20 53 4F 55 52:
>02E30 43 45 20 50 52 4F 47 52 41 4D 0D 3F 20 00 A2 00:
>02E40 A9 A0 9D BD 17 9D 3C 30 E8 E0 10 D0 F3 A2 00 20:
>02E50 CF FF C9 0D F0 08 9D BD 17 E8 E0 10 D0 F1 20 4F:
>02E60 FF 0D 45 4E 54 45 52 20 46 49 4C 45 4E 41 4D 45:
>02E70 20 4F 46 20 44 45 53 54 49 4E 41 54 49 4F 4E 20:
>02E80 50 52 4F 47 52 41 4D 0D 3F 20 00 A2 00 20 CF FF:
>02E90 C9 0D F0 08 9D 3C 30 E8 E0 10 D0 F1 A0 00 B9 50:
>02EA0 30 9D 3C 30 C8 E8 C0 04 D0 F4 E8 E8 8E 13 15 20:
>02EB0 4F FF 0D 49 4E 50 55 54 20 53 54 41 52 54 20 4C:
>02EC0 49 4E 45 20 4E 55 4D 42 45 52 20 3F 20 30 41 9D:
>02ED0 9D 00 20 73 30 8D 10 30 8C 11 30 20 4F FF 0D 49:
>02EE0 4E 50 55 54 20 4C 49 4E 45 20 49 4E 43 52 45 4D:
>02EF0 45 4E 54 20 3F 20 30 41 9D 9D 00 20 73 30 8D 12:
>02F00 30 8C 13 30 20 3A FB 20 42 13 20 76 18 AD DB 12:
>02F10 8D 3A 30 A9 03 A8 AE DC 12 20 BA FF AD 13 15 A2:
>02F20 3A A0 30 20 BD FF 20 C0 FF 20 99 13 A2 03 20 C9:
>02F30 FF A9 01 20 D2 FF A9 10 20 D2 FF 20 CC FF 20 D7:
>02F40 2F A2 03 20 C9 FF AD 74 18 AC 75 18 20 BE 2F 20:
>02F50 D7 2F A2 00 8E BB 17 A2 02 20 C6 FF 20 CF FF 48:
>02F60 A5 90 D0 17 20 CC FF 68 20 14 30 EE BB 17 AE BB:
>02F70 17 E0 15 D0 E2 20 B3 2F 4C 4F 2F 20 CC FF 68 20:
>02F80 14 30 EE BB 17 AE BB 17 E0 16 F0 00 A9 00 20 14:
>02F90 30 EE BB 17 AE BB 17 E0 16 D0 F1 20 B3 2F 20 D7:
>02FA0 2F A2 03 20 C9 FF 20 4F FF 45 4E 44 00 20 CC FF:
>02FB0 4C 54 30 A2 03 20 C9 FF AD D5 2F AC D6 2F 48 98:
>02FC0 20 10 FB 68 20 10 FB A9 00 8D D5 2F 8D D6 2F 20:
>02FD0 D2 FF 4C CC FF 00 00 A2 03 20 C9 FF A9 01 20 D2:
>02FE0 FF A9 10 20 D2 FF AD 10 30 20 D2 FF AD 11 30 20:
>02FF0 D2 FF A9 E3 20 D2 FF 20 08 FB 18 AD 10 30 6D 12:
>03000 30 8D 10 30 AD 11 30 6D 13 30 8D 11 30 4C CC FF:
>03010 00 00 00 00 8C 39 30 A2 03 20 C9 FF AD 39 30 20:
>03020 10 FB A9 2C 20 D2 FF 18 AD 39 30 6D D5 2F 8D D5:
>03030 2F 90 03 EE D6 2F 4C CC FF 00 30 3A 20 20 20 20:
>03040 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20:
>03050 2C 50 2C 57 AE DE 2C BE FE 07 A2 03 20 C9 FF A2:
>03060 00 8D DE 2C 20 D2 FF E8 EC FE 07 D0 F4 20 99 13:
>03070 4C 74 16 A2 00 20 CF FF C9 0D F0 07 9D 00 02 E8:
>03080 4C 75 30 86 F4 A9 00 85 F3 20 12 24 AD 59 24 D0:
>03090 05 A5 F1 A4 F2 60 20 4F FF 3F 0D 20 3F 20 30 41:
>030A0 9D 9D 00 4C 73 30 90 03 4C DB 28 20 5B FB A2 00:
>030B0 86 78 20 3F FB D0 05 E0 00 D0 01 60 C9 20 F0 EE:
>030C0 9D 4C 05 E8 E0 03 D0 EA CA 30 12 BD 4C 05 38 E9:
>030D0 3F A0 05 4A 66 78 66 77 88 D0 F8 F0 EB A2 02 20:
>030E0 3F FB F0 1E C9 20 F0 F7 20 7D FA B0 0E 20 8B FA:
>030F0 A4 F1 84 F2 85 F1 A9 30 95 77 E8 95 77 E8 E0 0A:
>03100 90 DD 86 9F A2 00 8E 4F 05 A2 00 8E 50 05 AD 4F:
>03110 05 20 D4 F7 AE 4B 05 86 A0 AA BD DB F8 20 EB 31:
>03120 BD 9B F8 20 EB 31 A2 06 E0 03 D0 13 A4 F5 F0 0F:
>03130 AD 4B 05 C9 E8 A9 30 B0 1E 20 EB 31 88 D0 F1 0E:
>03140 4B 05 90 0E BD 8E F8 20 EB 31 BD 94 F8 F0 03 20:
>03150 EB 31 CA D0 D3 F0 06 20 EB 31 20 EB 31 A5 9F CD:
>03160 50 05 F0 03 4C F7 31 A4 F6 F0 35 A5 A0 C9 9D D0:
>03170 26 A5 F1 E5 A1 8D 51 05 A5 F2 E5 A2 90 09 D0 09:
>03180 AE 51 05 30 7A 10 09 A8 C8 D0 74 AE 51 05 10 6F:
>03190 CA CA 8A A4 F6 D0 03 B9 F0 00 99 EC 02 88 D0 F7:
>031A0 AD 4F 05 99 EC 02 20 0A 32 20 35 FB A2 28 20 66:
>031B0 CF 20 C2 2A E6 F6 A5 F6 20 96 FB A9 41 8D 27 05:
>031C0 A9 20 8D 28 05 8D 2D 05 A5 A2 20 20 FB 8D 29 05:
>031D0 8E 2A 05 A5 A1 20 20 FB 8D 2B 05 8E 2C 05 A9 07:
>031E0 85 EF 4C DE 28 4C DB 28 20 EB 31 8E F3 07 AE 50:
>031F0 05 D5 77 F0 0D 68 68 EE 4F 05 F0 03 4C 09 31 4C:
>03200 DB 28 E8 8E 50 05 AE F3 07 60 20 60 13 A2 0F 20:
>03210 C9 FF 20 4F FF 4D 2D 57 00 A5 A1 20 D2 FF A5 A2:
>03220 20 D2 FF A4 F6 C8 98 20 D2 FF A0 00 B9 EC 02 20:
>03230 D2 FF C4 F6 F0 04 C8 4C 2C 32 20 99 13 4C 74 16:
>03240 20 8B DB 20 4F FF 20 20 20 20 20 20 20 20 20 20:
>03250 20 20 50 52 49 4E 54 45 52 20 20 4F 50 54 49 4F:
>03260 4E 53 2E 0D 20 20 20 20 20 20 20 20 20 20 20 20:
>03270 1C C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0:
>03280 C0 C0 05 0D 0D 20 20 20 20 20 20 20 20 20 20 20:
>03290 20 31 2E 41 4C 54 45 52 20 44 45 56 49 43 45 20:
>032A0 4E 55 4D 42 45 52 0D 20 20 20 20 20 20 20 20 20:
>032B0 20 20 20 32 2E 45 4E 41 42 4C 45 20 50 52 49 4E:
>032C0 54 45 52 0D 20 20 20 20 20 20 20 20 20 20 20 20:
>032D0 33 2E 44 49 53 41 42 4C 45 20 50 52 49 4E 54 45:
>032E0 52 0D 20 20 20 20 20 20 20 20 20 20 20 20 34 2E:
>032F0 45 58 49 54 0D 11 11 45 4E 54 45 52 20 43 48 4F:
>03300 49 43 45 20 28 31 2D 34 29 20 3F 20 00 20 E4 FF:
>03310 C9 31 90 F9 C9 35 B0 F5 48 20 D2 FF 20 3A FB 68:
>03320 38 E9 31 0A A8 B9 35 33 85 55 B9 36 33 85 56 20:
>03330 54 00 4C 40 32 3D 33 10 34 B0 34 D9 1D 20 88 DB:
>03340 20 4F FF 93 1D 1D 1D 1D 1D 1D 1D 1D 1D 41 4C 54:
>03350 45 52 20 44 45 56 49 43 45 20 4E 55 4D 42 45 52:
>03360 0D 1C 1D 1D 1D 1D 1D 1D 1D 1D 1D C0 C0 C0 C0 C0:
>03370 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 05 0D:
>03380 0D 43 55 52 52 45 4E 54 20 44 45 56 49 43 45 20:
>03390 4E 55 4D 42 45 52 20 49 53 20 2D 20 00 AD E5 35:
>033A0 20 10 FB 20 4F FF 0D 0D 45 4E 54 45 52 20 4E 45:
>033B0 57 20 44 45 56 49 43 45 20 4E 55 4D 42 45 52 20:
>033C0 28 30 34 2D 30 36 29 20 3F 20 00 A9 03 8D E6 07:
>033D0 A2 00 20 CF FF C9 0D F0 07 9D 00 02 E8 4C D2 33:
>033E0 86 F4 A9 00 85 F3 20 12 24 AD 59 24 D0 B5 A5 F1:
>033F0 C9 07 B0 AF C9 04 90 AB BD E5 35 60 A9 13 A0 35:
```

```
>03400 4C 07 34 A9 0E A0 CE 78 8D 14 03 8C 15 03 58 60:
>03410 20 88 DB 20 4F FF 20 20 20 20 20 20 20 20 20 20:
>03420 20 20 20 45 4E 41 42 4C 45 20 50 52 49 4E 54 45:
>03430 52 0D 1C 20 20 20 20 20 20 20 20 20 20 20 20 20:
>03440 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 05 0D:
>03450 4D 50 53 2D 38 30 31 2F 38 30 33 20 50 52 49 4E:
>03460 54 45 52 20 4F 52 20 53 49 4D 49 4C 41 52 20 28:
>03470 59 2F 4E 29 20 3F 00 A9 00 8D E4 35 20 E4 FF C9:
>03480 4E F0 09 C9 59 D0 F5 A0 01 8D E4 35 20 D2 FF 20:
>03490 FC 33 20 4F FF 0D 50 52 49 4E 54 45 52 20 4E 4F:
>034A0 57 20 45 4E 41 42 4C 45 44 11 11 0D 00 4C 90 16:
>034B0 20 88 DB 20 4F FF 20 20 20 20 20 20 20 20 20 20:
>034C0 20 20 44 49 53 41 42 4C 45 20 50 52 49 4E 54 45:
>034D0 52 0D 1C 20 20 20 20 20 20 20 20 20 20 20 20 C0:
>034E0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 C0 05 0D 11:
>034F0 11 00 20 03 34 20 4F FF 50 52 49 4E 54 45 52 20:
>03500 4E 4F 57 20 44 49 53 41 42 4C 45 44 11 11 0D 00:
>03510 4C 90 16 AD 43 05 C9 05 F0 03 4C 0E CE A9 02 8D:
>03520 09 FF AD 0A FF 29 FD 8D 0A FF A9 00 8D 43 05 85:
>03530 03 A2 0C 86 04 A2 19 86 05 20 BD FF A9 04 AE E5:
>03540 35 E0 03 D0 01 E8 A0 FF 20 BA FF 20 C0 FF A2 04:
>03550 20 C9 FF B0 09 A9 0D 20 D2 FF A5 90 10 03 38 B0:
>03560 70 A2 11 AD 13 FF 29 04 D0 02 A2 91 8A 20 D2 FF:
>03570 A0 00 B4 06 B1 03 C9 22 D0 09 AE E4 35 E0 00 F0:
>03580 02 A9 27 AA 30 08 24 06 10 13 A9 92 D0 06 24 06:
>03590 30 0B A9 12 20 D2 FF A5 06 49 80 85 06 8A 0A 0A:
>035A0 08 8A 29 3F C9 20 B0 02 09 40 28 90 02 09 80 20:
>035B0 D2 FF C8 C0 28 90 BD C6 05 F0 0C A5 03 69 27 85:
>035C0 03 90 92 E6 04 D0 8E A9 0D 20 D2 FF A9 0A 20 D2:
>035D0 FF A9 04 20 C3 FF 20 CC FF AD 0A FF 09 02 8D 0A:
>035E0 FF 4C 0E CE 00 04 20 3F FB C9 4D F0 03 4C 46 11:
>035F0 20 17 36 A2 04 20 C9 FF 20 FB 23 A0 3F 84 F2 20:
>03600 C9 10 20 3A FB 20 CC FF 20 0E 36 4C 49 11 A9 04:
>03610 20 C3 FF CE 2F 36 60 A9 00 20 BD FF A9 04 AE E5:
>03620 35 A0 FF 20 BA FF 20 C0 FF B0 E3 EE 2F 36 60 00:
>03630 20 3F FB C9 44 F0 1F C9 4D F0 03 4C DB 28 20 17:
>03640 36 20 74 2A 20 52 29 20 3A FB 20 CC FF A9 04 20:
>03650 C3 FF CE 2F 36 60 20 17 36 20 74 2A 20 83 2A 4C:
>03660 47 36 8E FF 07 A9 00 85 EB 20 3F FB F0 52 C9 20:
>03670 F0 F7 C9 22 D0 28 20 3F FB C6 F3 C9 40 D0 05 EE:
>03680 EB 37 E6 F3 A0 00 A6 F3 E4 F4 B0 34 BD 00 02 EB:
>03690 C9 22 F0 0D 99 5D 02 E6 EB C8 C0 11 90 EA 4C DB:
>036A0 28 86 F3 20 3F FB 20 74 2A B0 15 20 5B FB 20 74:
>036B0 2A B0 EB 20 3A FB AD FF 07 C9 0B D0 E1 4C F4 36:
>036C0 20 42 13 A2 0F 20 C9 FF A9 26 20 D2 FF AD DB 12:
>036D0 20 D2 FF A9 3A 20 D2 FF A2 00 E4 EB F0 0A BD 5D:
>036E0 02 20 D2 FF E8 4C DA 36 20 CC FF 20 99 13 20 74:
>036F0 16 4C DE 28 20 64 FB A5 F2 D0 A3 20 60 13 AD DB:
>03700 12 8D D5 37 A0 02 A2 00 E4 EB F0 0B BD 5D 02 99:
>03710 D5 37 C8 EB 4C 08 37 A2 00 BD E7 37 99 D5 37 C8:
>03720 E8 E0 04 D0 F4 AD EB 37 F0 09 C8 98 A2 D4 A0 37:
>03730 4C 38 37 98 A2 D5 A0 37 20 BD FF A9 0D A8 AE DC:
>03740 12 20 BA FF 20 C0 FF A9 00 8D EB 37 20 99 13 A2:
>03750 0F 20 C9 FF 20 4F FF 4D 2D 52 00 A5 A1 20 D2 FF:
>03760 A5 A2 20 D2 FF E6 F1 A5 F1 20 D2 FF 20 3A FB 20:
>03770 CC FF A6 A1 18 65 A2 69 00 18 65 F1 69 00 8D 3D:
>03780 05 A2 0F 20 C6 FF A2 00 20 CF FF 9D 00 3E 18 6D:
>03790 3D 05 69 00 8D 3D 05 E8 E4 F1 D0 EC 20 CC FF A2:
>037A0 0D 20 C9 FF A5 A1 20 D2 FF A5 A2 20 D2 FF A5 F1:
>037B0 20 D2 FF A2 0D A2 00 BD 00 3E 20 D2 FF E8 E4 F1:
>037C0 D0 F5 AD 3D 05 20 D2 FF 20 CC FF 20 99 13 20 74:
>037D0 16 4C DE 28 40 30 3A 20 20 20 20 20 20 20 20 20:
>037E0 20 20 20 20 20 20 20 2C 55 2C 57 00 FA FA FA FA:
```


## YOUR COMMODORE

**Lineage: 58p per word.**
**(including VAT)**
**Semi display: £10.95 plus VAT per single column centimetre minimum 2cm. Ring for information on series bookings/discounts.**

All advertisements in this section must be prepaid.
Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request).

**01-437 0699**

**Send your requirements to:**
**ALAN COLE**
**CLASSIFIED DEPARTMENT**
**ASP LTD, 1 GOLDEN SQUARE, LONDON W1**

## DISCS

### SPECIAL OFFERS TO CELEBRATE OPENING OUR NEW SHOP!

**3.5 in Disks (Double sided, double density)..............86p**
**(Min QTY 10) incl VAT & P&P**
**5¼ in Disks (Double sided, Double density) 48 TPI...40p**
**(min QTY 25) incl VAT & P&P**

ATHENE CONSULTANTS (MEDIA CENTRE),
16 Stoke Road, Gosport, Hampshire PO12 1JB

**TEL: 0329 282083 (24 hr Credit Card Hotline)**
***OR* 0705 511 439 (Office Hours)**

## MIDI PRODUCTS

SONUS

INNOVATIVE 'MIDI' SOFTWARE PRODUCTS
See April '88 Review, Page 65
Take advantage of our low prices, - send SAE for free leaflets to:

**SONUS INTL LTD, PO Box 18,**
**Wokingham RG11 4BP Berks**
**Tel: (0734) 792699**

# YOUR COMMODORE

Lineage: 58p per word.
(including VAT)
Semi display: £10.95 plus VAT per single column centimetre minimum 2cm. Ring for information on series bookings/discounts.

All advertisements in this section must be prepaid. Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request).

**01-437 0699**

Send your requirements to:
ALAN COLE
CLASSIFIED DEPARTMENT
ASP LTD, 1 GOLDEN SQUARE,
LONDON W1R 3AB.

## SOFTWARE

### YOUR COMMODORE SPECIALS

**TECH DRAW 64** - A comprehensive technical illustration aid for C64 owners for both disk and tape. Commands available include LINE DRAW, RAYS, BOX, CIRCLE, ARC, ELLIPSE, FREEHAND, FILL, HATCH & TEXT. Wipe copy, move and rotate, save and load or print your drawing all for £8.95 tape or disk. Order Codes TD64T (tape) TD64D (disk)

*Full details in Your Commodore July 1987.*

**SPEEDY ASSEMBLER**

Your Commodore's very own Assembler, a 100% memory resident program for loading from tape or disk, featured in the Your Commodore Machine Code Series and now the Y.C. standard assembler only £9.95 Tape or Disk. Order Codes YSPASSD (disk) YSPASSR (tape)

Order from Your Commodore Readers Services at 9, Hall Road, Maylands Wood Estate, Hemel, Hempstead Herts HP2 7BH. Please make cheques payable to A.S.P. Ltd., or telephone your Access/Visa order on 0442 41221

### X RATED
**ADULTS ONLY GAME**
**FANTASY**
Commodore 64/128 **£6.50**
**inc p&p**
Available to persons over 18 only. Please state age when ordering.

**R'n'H MICROTEC**
**32 Hazell Way, Stoke Poges, Bucks SL2 4DD.**

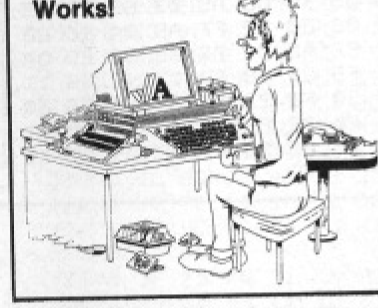
**Please See Previous Page For Discs and mini Products.**

### C64 GAME WRITERS

Give your games a professional finish with our copyright *FREE* packages. Disks/Tape incl.
LT1;; 300 Sprites (50 Objects) .......... £4.95
LT2; 50 SFX (1,2,,,&3 Channel) .......... £4.49
LT3; 3 Soundtracks (Title, In-Game, Game Over, Hi Score & Misc .......... £5.79
*Full instructions incl*
Cheques P/O to:-
**LATERAL THOUGHT**
**PO Box 418, Rutherglen, Glasgow G73 2EY.**

## SERVICES

**C64 C128**
**READIDATA**
**The Commodore Specialists For Repairs**
**C16 Call 01-861-2835 +4**




### C64 POWER SUPPLIES
£13.50 inc. P&P
Refurbished 6 month guarantee.
Cheques/Postal Orders.
To:- B. Thompson, 23 Curzon Street, Derby.
Tel: 0332 291 219
Trade Enquiries Welcome.

## DISCS

**DISKART**

READY-TO-USE
**GEOS GRAPHICS DISKS**

Attention GEOS users! Tired of going through the cost and expense of converting other graphics so the GEOS format? Here are disks or ORIGINAL graphics that take advantage of the great GEOS operating system! Created with GEOS for GEOS each of these disks provide a selection of graphics that will tickle the eye (and the wallet).

| | | |
|---|---|---|
| **DISKART 1** (assorted) | | |
| Graphics Goodies 1 | Weather Stuff 1 | Graphic Goodies 2 |
| Holidays 1 | GEOpaint Tips 1 | GEOpaint Tips 2 |
| **DISKART 2** (assorted) | | |
| Graphic Goodies 3 | U.S. Map 1 | Little Guys 1 |
| Workdisk Labels | Holidays 2 | GEOpaint Tips 1 |
| Musical Stuff 1 | | |
| **DISKART 3** (wheels and wings) | | |
| Vehicles 1 | Vehicles 2 | DC-3 Airliner |
| PORSCHE 959 | F4 Phantom | Warbirds 1 |
| Tin Lizzies | Nieuport 17 | |
| **DISKART 4** (assorted) | | |
| Little Guys | Ovals/ Blocks/ etc | Foodstuff 1 |
| C64 and Periphs | Tools 1 | Spring/ Summer stuff |
| **DISKART 5** (assorted) | | |
| Make-A-Face | Drafting Equip | Vehicles 3 |
| Banners 1 | Flowchart Symbols | Little Women 1 |
| Little Women 2 | Houses 1 | |
| **DISKFORMS** (5 different, blank, forms, plus 3 ready-to-print forms) | | |
| INSTRUCTIONS | Lined Paper | Delivery Receipt |
| Blank Form 1 | Inventory Form | Bank Deposit Form |
| Blank Form 2 | Blank Form 3 | GEOpaint Tips 1 |
| Blank Form 4 | Blank Form 5 | |
| **MUSI-KIT** (create professional-looking sheet music) | | |
| Musi-Kit Info | Piano Title | Piano Stuff |
| Musi-Kit | Single Title | Single Staff |
| Large Instruments | Sample Sheet | |

**TO ORDER:** Send **£9.95** for each disk. To: **Financial Systems Software Ltd.**, 2nd Floor, Anbrian House, St. Mary's Street, Worcester WR1 1HA. Tel: **(0386) 750217** (9.30 to 8.30 pm) GEOS is a registered trade mark of Berkeley Softworks.

## RIBBONS

| | | | |
|---|---|---|---|
| Cannon PW 1080A | £2.69 | Commodore MPS803 | £2.75 |
| Citizen 120D | £3.50 | Epson MX/RX/FX80 | £2.75 |
| Citizen MSP10 | £2.75 | Epson LX80/86 | £2.40 |
| Commodore 4022 | £2.75 | Kaga Taxan | £2.69 |
| Commodore 4023 | £2.90 | Seikosha GP100 | £2.10 |
| Commodore MPS801 | £2.60 | Star NL10 | £4.10 |

*Please add 15% VAT, carriage free.*

**T-Systems Ltd**
**The Signal Cabin, 61 High Street, Orpington, Kent BR6 0JF**
**Access card accepted. Tel: 0689 22196**

**MARKET YOUR EXPERTISE**



**IN YOUR COMMODORE**
**CALL ALAN COLE ON 01-437 0699 TODAY!**

## SPECIAL OFFERS

**DISCOUNT SOFTWARE:** Latest titles for CBM64/128 at 75% off R.R.P.: S.A.E. To: A.O.W. 104 Hollywell Road, Lincoln. LN5 9BY.

## LANGUAGES

**PLUS4 FORTH DISK. £24.95**
MetacomPiler, FIG/79. 32 Kbytes.
Auto Tape/disk and Start.
HIRES: DRAW & DUMP. DEFINABLE
CHARS: Complete with 50+ commented screens.
**TENSAL TECHNOLOGY**
**15, Penrice Close, W-S-M. Avon. BS22 9AH**

ADvertisers Plan your autumn advertising in YOUR COMMODORE

Call Alan Cole on 01 - 437 0699 For Details of Series Discounts

or write to the Classified Department Argus Specialist Publications 1 Golden Square London W1R 3AB

### CLASSIFIED ADVERTISING TERMS & CONDITIONS

Our terms for new advertisers (semi-display and lineage) are strictly pro-forma payments until satisfactory reference can be taken up (excluding recognised advertising agencies). Cheques and P.O.'s should be crossed and made payable to ARGUS SPECIALIST PUBLICATIONS LTD and sent together with the advertisements to:

**The Classified Dept.,**
**No. 1 Golden Square,**
**London W1R 3AB.**

There are no reimbursements for cancellations. Advertisements arriving too late for a particular issue will be inserted in the following issue unless accompanied by instructions to the contrary. It is the responsibility of the advertiser to ensure that the first insertion of every series is published correctly, and corrections must be notified in time for the second insertion, otherwise the publishers will not accept liability or offer any reduction in charges.

All advertising sales are subject to Government Regulations concerning VAT. Advertisers are responsible for complying with the various legal requirements in force eg: The Trade Description Act, sex discrimination act & the business advertisements (disclosure) order 1977.

*Full Terms & Conditions of Advertising available on request.*

# Repairs Guide

CALL

ALAN COLE

ON

01 — 437 0699

---

PROBLEMS WITH YOUR COMMODORE ?

**FOR FAST, RELIABLE AND PROFESSIONAL REPAIRS AT COMPETITIVE PRICES**

## P M ENGINEERING

VISA

UNIT 8, NEW ROAD, ST. IVES,
CAMBRIDGESHIRE. PE17 - 4BG

ST. IVES (0480) 61394

*We can also supply Hardware, Software, Blank Disks, Accessories and Spare parts.*

---

## COMPUTER REPAIRS

SPECTRUM, COMMODORE, AMSTRAD, ACORN, BBC etc.
Fixed charge repairs on all makes
**Please ring for details:**

**MCE SERVICES**

**33 Albert Street,**
**Mansfield, Notts NG18 1EA**
**Tel: 0623 653512**

---

## SPECIALIST COMMODORE — G-TEK — COMPUTER REPAIRS

| | |
|---|---|
| Commodore 64 | £21.00 |
| Commodore 16 | £19.00 |
| Commodore +4 | £20.00 |
| Commodore 1541 | £25.00 |
| Commodore Modem | £16.00 |
| Commodore 128 | £30.00 |
| Commodore 801/802 | P.O.A. |
| Commodore 1520/11526 | P.O.A. |

*(ALL ABOVE PRICES INC. VA.T.)*

Repairs carried out by ex-commodore technicians. A full test and service including a 4 month warranty with every repair (Commodore spares available on request)
Make cheque/Postal Order payable to: G-TEK.
*(Please include £3.00 post)*
**UNIT G, LAMMAS COURTYARD, WELDON INDUSTRIAL ESTATE CORBY NORTHANTS NN17 1EZ Tel: (0536) 69454.**

---

## COMMODORE SERVICE CENTRE

Fast repair service for:-
★ VIC 20 ★ C16/★4 ★ CBM 64/CBM C64★
★ CBM 128 ★ AMIGA ★ DISC DRIVES ★
★ all other makes as well ★
All units repaired to original standard by fully qualified staff. All repairs guaranteed.
★ We stock repairs for all computers ★
Mail orders and phone orders, access & visa accepted.
Personal callers always welcome.
★ On the premises repairs, quick turn around ★
**QUANTAM ELECTRONIC SERVICES,**
**33 City Arcade, Coventry, CU1 3HX. Tel: 0203 24632 or 0926 37648**

---

## VTS COMPUTER REPAIRS

**01 - 407 9829**

Simply send your unit to the address below securely packed with fault description and max fee.
COMMODORE, AMSTRAD, BBC, SINCLAIR + MORE.........**£28.00**

## VTS COMPUTER REPAIRS

**12 Lyly House, Gt. Dover Street, London, SE1 4EQ.**
***FAST, RELIABLE TURNAROUND***

---

**SPARES REPAIRS SALES**

all makes of computers & peripherals
Fast Reliable Guaranteed Service
**Contact Dave Barber T.Eng., AMIERE**

**db ELECTRONIC SERVICES**

**205 Meadgate Avenue, Gt. Baddow, Chelmsford, Essex. CM2 7NJ**
**Tel: 0245 - 260874**

---

## CROYDON COMPUTER CENTRE

**25 Brigstock Road, Thornton Heath, Surrey, CR4 7JJ Tel: 01 683 2646**

**COMPUTER SERVICING**

(Est'd since 1979)
We repair — on the premises — quick turnround
★ Commodore & Spectrum
★ BBC & Electron (Approved Service Centre)
★ Amstrad & Torch (Approved Service Centre)
★ Disc Drives, Printers, Monitors
**Mail Orders by phone Access & Visa accepted**

---

## COMMODORE SPARES & REPAIRS

| | |
|---|---|
| 906114-01 | £9.30 |
| 6510 | £9.95 |
| 6569 | £22.50 |
| 6526 CIA | £9.50 |
| 6581 SID | £11.25 |
| 901227-03 | £8.90 |
| 901226-01 | £12.65 |
| 901225-01 | £8.30 |
| 8501 | £8.95 |
| 8360 | £21.50 |
| 251641-02 | £8.50 |
| 8701 | £9.85 |
| C64 PSU | £23.00 |
| C64 MOD | £27.00 |
| C64 DATA SET | £28.00 |
| C128 PSU | £69.00 |

INCL. VAT & P&P

**OASIS**

**Dept. 4C, 14 RIDGEWAY ROAD, SALISBURY, WILTSHIRE, SP1 3BU. TEL: (0722) 335061**

---

Commodore warranty repairers offer spares and repairs on the full range of commodore CBM products, including all Amigas.
*Phone or write for free estimates to:-*
**D.P.C.E. Volume Repair Centre**
**Wilkinson House, Telspace II, Stafford Park, Telford,**
**Tel: 0952 620 488**
***Ask for Pauline***

---

## COMPUTER REPAIRS

***Fixed Super Low Prices!***
Inclusive of parts, labour and VAT

**FIRST AID FOR TECHNOLOGY**

**1 week turnaround Collection/delivery available for local area**

**★ SUPER OFFERS ★**

| | |
|---|---|
| **SPECTRUM** | **£14 inc. + Free Game** |
| **C64** | **£22 inc. + Free Game** |
| **C16** | **£18 inc.** |
| **VIC20, C+4** | **£22inc.** |
| **BBC** | **£32 inc.** |
| **ELECTRON** | **£32** |
| **COMMODORE 1541 DISC DRIVE** | **£38 inc.** |
| **SPECTRUM 129** | **£16 inc.** |
| **C64 P.S.U. for sale** | **£20 inc.** |

*Please enclose payment with item - 3 month warranty on repair. Please enclose advert with repair*

**W.T.S. ELECTRONICS**

**Y.C. 5-9 Portland Road, Luton, Beds LU4 8AT. Tel: 0582 458375. Telex: 265871**

All rights reserved.

---

*SPARES AND REPAIRS* **HEATH COMPUTERS** *WE FIX MOST MAKES OF COMPUTERS*

| SPARES | | REPAIRS | |
|---|---|---|---|
| CBM64 PSU | £22.00 | CBM 64 | FROM £25.00 |
| 6569 | £17.50 | CBM 16 | FROM £25.00 |
| 6581 | £10.00 | CBM +4 | FROM £25.00 |
| 8501 | £10.00 | CBM 128 | FROM £30.00 |
| 6561 | £10.00 | BBC | FROM £30.00 |
| 6510 | £10.00 | AMIGA | PRICE ON APP |
| 6526 | £10.00 | CASSETTE | FROM £10.00 |
| KERNAL ROM | £10.00 | 1541 | FROM £25.00 |
| BASIC ROM | £10.00 | CBM PRINTERS | FROM £25.00 |
| PLA | £12.00 | | |

**HEATH COMPUTERS & ELECTRONICS LTD**
**PLEASE ADD VAT TO ALL PRICES**
**TEL: 021-707 7160**

# BREAK

## Bug Finder

We'd like to remind our readers that we run a Bug Finder service.

If you have typed in one of our programs and despite much checking, you still can't get it to run, then send us the following:

Two copies of your program on tape or disk.
A description of your problem.
If possible a listing of your work (you may omit this).
A stamped, self-addressed envelope for return of the program to you.

Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made errors and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working, please check it several times first.

We do get a large number of queries and so it may take a while for us to deal with yours personally.

**Note:** we can only deal with problems relating to programs published in *Your Commodore*.

## Commodore Where Are You?

At the *Your Commodore* office we are repeatedly asked for the address and telephone number of Commodore U.K. Many people, after referring to their computer manuals, believe them to be based in Corby.

The Commodore plant at Corby was closed down some time ago. Reproduced here you will find the correct address for Commodore U.K.

We suggest that you write this correct address in the front of your computers manual for future reference.

Commodore Business Machine, (UK),
Commodore House,
The Switchback,
Gardner Road,
Maidenhead,
Berks SL6 7XA.

## Oops

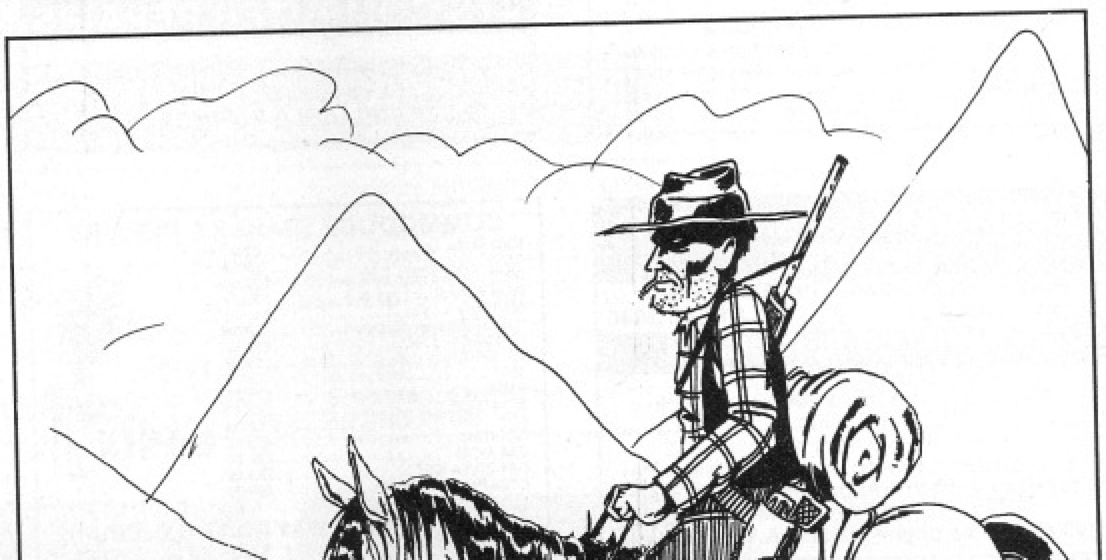
Correction to Easy Basic Toolkit (June '88).
Saver Program:
The last data item in line 90 should be 144 NOT 137.
Tape users should type POKE40715,1 after running.
All users should then type SYS40704 to start the save.
Code program: The following lines were miss-printed,
Line 110 DATA 83, 84, 65, 82, 84, 44, 83, 84, 69, 80, 13, 13, 32, 32, 32, 32, 912
line 4340 DATA
32, 40, 186, 230, 253, 76,184,196,166,2,224, 4,208,11,32,59,1903
line 4430 DATA
166,20,32,205,189,169,52,160, 197,32,30,171,165,21,3,2,135,1776

At the *Your Commodore* office we receive hundreds of letters from readers every month. We do try and answer each individually but sometimes this is impossible due to pressure of work. If you have written to us and not received a personal reply, we apologise for this but we cannot promise to reply to every item of mail we receive. If you feel that your question or letter really needs an answer, then inclusion of an s.a.e. will guarantee a reply, although this may still take time to arrive.

Two puzzles for you to try and solve this month, with a prize of a binder for each. You can enter for both by using the same envelope but please write your entries on a separate piece of paper. Normal *Your Commodore* rules apply. Good luck!
Closing day Sept 30th 1988.

**A**
A cowboy rode into the town of Dead Man's Gulch on Tuesday. There was only one hotel in the town and Fast Fingered Freddy booked himself for one night only. He left town on Thursday. How do you explain this apparently anomalous state of affairs?

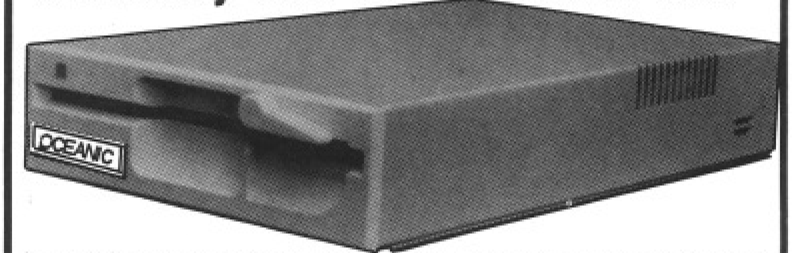
**B**
A man stands on a tower that is 500 feet high. A few miles to the north is a tall mountain range. To the west is the sea and eastwards is an endless desert. Looking south, he can see a small town with a large forest beyond. What we want to know is, on a clear day, how far (in miles) can the man see?



# Evesham Micros

# OCEANIC OC-118

## Previously sold as 'Excelerator Plus'




A superb package representing extremely good value for money, combining the Oceanic OC-118 disk drive (previously sold as 'Excelerator+') and the sophisticated GEOS system. Said by COMPUTE's Gazette to have "dramatic improvements over the 1541 in quality and reliability", the drive is a stylish and attractive compact unit featuring a direct drive motor and its own external power supply. GEOS brings the power of a graphic interface and integrated disk turbo to your '64 and includes geoPAINT, a graphic workshop, geoWRITE, a WYSIWIG word processor and many Desk Accessories. Many more extensions available - see below.

**Oceanic OC-118 & GEOS ..... £129.95**

**Oceanic OC-118 & GEOS plus *Freeze Machine* ............ £149.95**

## GEOS Applications

| | | | |
|---|---|---|---|
| GEOS 64 | £24.95 | GEOPUBLISH | £32.95 |
| GEOFILE | £24.95 | GEOPROGRAMMER | £32.95 |
| GEOCALC | £24.95 | GEOS 128 | £32.95 |
| DESKPACK+ 64/128 | £21.95 | GEOWRITE WORKSHOP 128 | £32.95 |
| GEOWRITE WORKSHOP | £24.95 | GEOCALC 128 | £32.95 |
| FONTPACK+ 64/128 | £16.95 | GEOFILE 128 | £32.95 |
| GEOSPELL | £16.95 | | |

***All prices include VAT/delivery***




# star LC-10

## Best-selling CBM ready printer

Enormously successful addition to the Star range of printers, the LC-10 incorporates many useful features at an ultra low price. Includes many facilities not normally available in the sub £200 price range, such as 4 NLQ fonts and paper parking (use single sheets without removing tractor paper). 7-colour version also available, which will accept standard LC10 black ribbons. LC10 available either in '64/128 ready form or as parallel version for Amiga users. Please state your computer type when ordering.

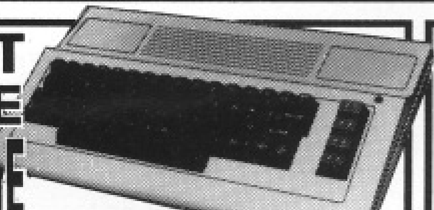
**Only £199.00**

**Colour version also available,**

**Only £234.00**

**Prices include two extra black ribbons free of charge**

# GET THE SLIMLINE '64



***Your '64 could look like this!***

Why put up with an old fashioned looking computer? Fit this smart and modern looking new case to your '64 - it will look and feel like you are using a brand new computer. This high quality injection moulded case is simple to fit and gives a lower keyboard height. Reject the old image and order one *now*.

**Only £19.95**

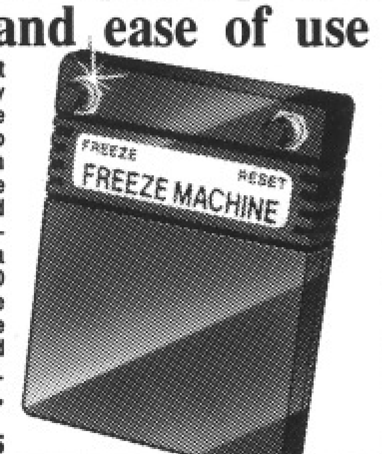
# FREEZE MACHINE for speed, power and ease of use

- **Unstoppable Freeze**
- **Fast save routines**
- **Ultra-efficient file compactor**
- **Lazer and Turbo fastloads**
- **Integral reset button**
- **Tape turbo facilities**
- **12 second disk format**
- **Selective file copier**
- **Selectaload**
- **many more useful features!**

**Only £28.95**

For speed, power and ease of use it has to be Freeze Machine, probably the most effective backup cartridge on the market! Incorporating two types of fast load routines you can SAVE and reLOAD your favourite games in as little as 10 seconds and no more than 18. Numerous invaluable facilities available, including a built-in reset button. Utility Disc V3.0 also available to complement usage of the cartridge. It allows complete transfer to disk of many tape-based programs that load extra parts, eg. Gunship, Last Ninja, World Games, Supercycle. A very useful add-on.

**Utility disc only ........... £7.95**




# *Selected Products*

**LOAD IT!! ......** The best thing to happen to a Commodore data recorder. Includes built-in azimuth adjustment knob and LED tape signal level meter ............ **£39.95**

**DOUBLER '64 ......** Makes perfect tape backups every time. Consists of hardware and software. Requires access to two data recorders. Very easy to use, only ............ **£12.95**

**ICONTROLLER ......** Natty little keyboard mounted cursor controller, ideal for icon-driven applications like GEOS ............ **£11.95**

**DOLPHIN DOS ......** Parallel operating system for use with 64/128 and 1541 disk drive. Fantastic speed increase on LOAD and SAVE whilst maintaining CBM disk format. Many extra DOS & BASIC commands, includes built-in monitor and Centronics printer driver ..... **£69.95**

**DISC DISECTOR V5.0 ......** Disk backup/utility package featuring wide range of powerful programs. Compatible with 64/128/128D and 1541/1570 disk drives ............ **£19.95**

**1541 PHYSICAL EXAM ......** Consists of digital alignment disk and drive fault diagnosis software to check and correct 1541 head alignment. Includes quiet drive stops ............ **£39.95**

**1541 QUIET DRIVE STOPS ......** Silences 'knocking' noise with 1541 drives (not suitable for 'turn lever' type drives) ............ **£4.95**

**DATA RECORDER ......** CBM compatible, same as C2N/1531 but cheaper and includes pause control button ............ **£24.95**

**AZIMATE 3000 KIT ......** Tape loading problems? Use this kit to check and adjust data recorder head alignment ............ **£6.95**

## AMIGA 500

**AMIGA 500** ............ **£389.00**
standard 512K model, including Mouse, Silent Service and 5 disks of Public Domain software.

**Phillips CM8833** (Colour monitor suitable for Amiga 500) ............ **£279.00**

**Phillips CM8852** monitor as above, but higher resolution ............ **£299.00**

## Disks & Boxes

**25 bulk packed 5.25" DS/DD disks** with sleeves, write protect tabs and labels. Good quality and fully guaranteed, only ......... **£13.95**

**25 disks + box.** Disks as above plus 50 capacity lockable storage box, only .......... **£22.95**

**25 disks + 100 box.** As previous offer but with 100 capacity locking box ............ **£24.95**

**50 capacity box.** Lockable storage unit for 5.25" disks with smoked perspex top ....... **£10.95**

**100 capacity box.** Larger version ............ **£13.95**

## How to order from Evesham Micros

**All prices include VAT and delivery. Next day delivery £5.00 extra.**

*Send cheque, Postal Order or ACCESS/VISA card details*

**Phone us with your ACCESS or VISA card details on : ☎ 0386-765500**

Govt., educ. & PLC orders welcome
Same day despatch whenever possible
All goods subject to availability, E.&O.E.
Open to callers 6 days, 9.30-5.30

**Evesham Micros Ltd**
**63 BRIDGE STREET**
**EVESHAM**
**WORCS WR11 4SF**
**✆ 0386-765500**
fax 0386-765354
telex 333294

*Also at:* 1762 Pershore Rd., Cotteridge, Birmingham B30 3BH Tel: 021 458 4564




# Quite simply, it leaves other word processors lost for words.

WordPerfect 4.1 for the Amiga includes many features not found in other word processors.

Newspaper style columns can be displayed on screen, 110,000 word UK phonetic dictionary, word-count, background printing and automatic reformatting increase efficiency.

Line drawing and rulers, search/replace and 5-function maths are invaluable assets.

By using the Amiga's pulldown menus nearly all WordPerfect's features are available at the click of a mouse. This makes learning easier than ever before and using it a real pleasure. But if you prefer the traditional function keys there is a colour coded template to make life easy.

What you see on the screen is what will actually print. This makes good, professional layouts simple.

Documents are treated as a whole and not a series of pages. Reformatting and repagination after editing are automatic and very rapid.

However fast you type, you will never be too fast for WordPerfect.

To find out more, write to the address opposite.

And see how WordPerfect delivers today what others are still searching for.




SENTINEL
SOFTWARE

Wellington House, New Zealand Avenue,
Walton on Thames, Surrey KT12 1PY.
Telephone: (0932) 231164
Telex: 916005. FERGUS G.

WordPerfect DataPerfect PlanPerfect Library Executive




# …ply, it leaves …processors …words.

…pleasure. But
…e traditional
…there is a
…emplate to

…e on the screen
…tually print.
…od, professional

…are treated as a
… a series of
…atting and
…fter editing are
… very rapid.
…st you type, you
…too fast for

…more, write to
…pposite.

And see how WordPerfect delivers today what others are still searching for.




SENTINEL
SOFTWARE

Wellington House, New Zealand Avenue,
Walton on Thames, Surrey KT12 1PY.
Telephone: (0932) 231164
Telex: 916005. FERGUS G.

…PlanPerfect | Library | Executive


Your Commodore September 1988

Volume 4 Number 12

YOUR

# COMMO…

SEPTEMBER 1988

## PARTNER–The ultimate companion for your C128

**Games Reviewed:**

Buggy Boy  Wasteland
Track Suit Manager
Dark Castle



COMPUTER MUSIC – T…

UNBEATABLE PR…

MUSIC COMPOSER □ SAMPLER 64 □ FX…